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ABSTRACT

This instructor's guide contains materials for a 20-30 hour course designed to address essential math skills in the workplace. The course description lists target audience, general objective, and typical results observed. The next section gives instructors basic information related to providing successful educational programs in a workplace setting, an instructor's lexicon of strategies and principles that can be used in teaching, instructor's role and responsibilities, and course objectives. An explanation of lesson format lists six parts of the template used to design the lessons--understanding/outcome, materials, demonstration, exercise/engagement, workplace application, and evaluation/comments. A sample template and explanation of each part follows. A section on planning and scheduling deals with time requirements, class size, expected outcomes, prerequisites, and suggested timing for each lesson. Lesson topics are as follows: math memories; keeping track of learning; introduction to math operations; place value; rounding off numbers; using a calculator to check your work; introduction to decimals; changing time to decimal equivalents; calculating your pay; rounding decimals; and finding an average. Supplementary lessons are provided on fractions and finding percentages. Appendixes include a word list and preview and review with scoring guide. (YLB)

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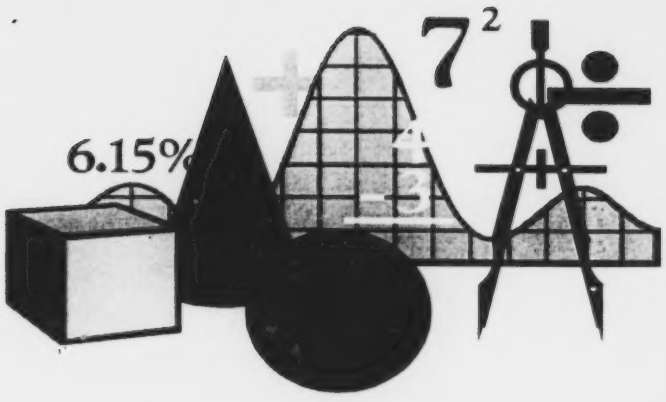

Numbers at Work

Instructor's Guide

Nancy Ruetz

Project ALERT

CE 077 299

Wayne State University
College of Education

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Numbers at Work

Description: This course is designed to address essential math skills in the workplace. An effort is made to remove barriers to learning by building a safe environment to admit skill weaknesses or deficits. Many participants who are in need of fundamental math improvement have had negative educational experiences. The approach to teaching integrates application of skills into the workplace by using actual examples from the company. The objectives of this course include:

- To demonstrate mastery of addition, subtraction, multiplication, and division of whole numbers as related to the needs of the workplace..
- To demonstrate fractions and decimals as related to the needs of the workplace..
- To understand the calculation of weights as related to the needs of the workplace..
- To understand the calculation of time as related to the needs of the workplace..

Length of time: This course is designed to provide 20-30 hours of instruction. Amount of time may vary depending on the entry math skills of participants. Refreshing math skills takes much less time than teaching them to those who never mastered them initially.

Target audience: Employees who wish to improve their fundamental math skills for the workplace.

General objective: Participants of this class will improve their math skills as determined by their workplace.

Typical results observed: Participants were eager to improve math skills that were necessary for filling out forms, pay records, etc. In the pilot section, employees had much difficulty computing a complex formula for determining their weekly pay that included incentives, down-time, and decimal equivalents of the hour.

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Rationale for Curriculum Approach

The Whole Language philosophy provides the best approach for developing the learner. It supports success in the classroom and on the job. The integration of the curriculum reinforces all of the skills required to improve job opportunities. The key to providing a successful Whole Language program is assuring that every learner will be recognized as a potentially successful student. The learners must be co-partners in this collaborative effort. Learners are an integral part of the learning situation. They are valued for what they bring to the learning experience. The instructor is regarded as a facilitator of learning rather than the major source of knowledge and information.

Recognizing and building upon their unique past experience is crucial for integrating new learning. In this process, continual dialogue and interaction are key to the instructional process. The curriculum is built on the learners' strengths, not weaknesses, and accommodates the variety of learning styles and cultural orientations. It also encourages the learner to assume responsibility for his/her own learning. Recognition of success in the classroom enables learners to feel good about themselves. Learners become empowered workers by understanding the job process and how they contribute to the big picture.

Overall, raising the learners' level of self-awareness on the job, in the home, and in the community, will create a more satisfied and productive member of the work force.

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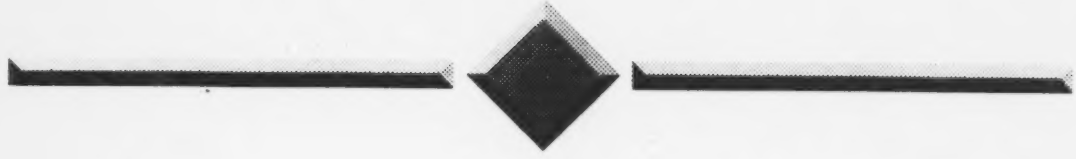
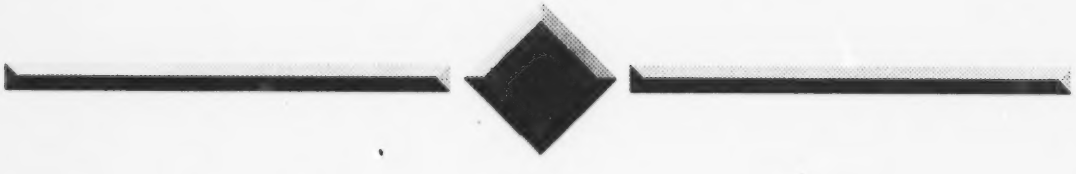


Making it Work



This section of materials is provided to give instructors basic information related to providing successful educational programs in a workplace setting.

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Adult learners

General characteristics of adult learners:

1. Purposeful learning occurs with adults experience a problem or recognize a gap between where they are and where they want to be, then start to draw on resources to acquire the learning they consider necessary to close the gap.
2. One of the most important issues to consider from the adult learner point of view is "What's in it for me?" An adult needs to know that there is real value in what is being taught. Customize and adapt lessons to suit your students. Make a regular effort to point out what benefit the instruction has for the student. Many times students are unaware of the applications of learning. Make sure you point out possible applications of knowledge.
3. Adult learners insist that learning have relevance and value now, contrasted to youthful learners whose education is largely subject-centered and future-oriented. Most adults are already busy with their jobs and families, so the learning must be worthwhile.
4. Adult learners will drop out of educational situations that are seen as not accomplishing their own agenda.
5. The central organizing principle for adult learning must be around finding solutions for problems adults face. Emphasis must be on helping adults learn to cope with problems they face. Therefore, the instructor must be more *person*-centered than subject-centered.
6. Adult learners are well aware of what they need to know, and they like to participate actively in all phases of their education--assessment, instruction, and evaluation.
7. Many adult learners come into programs with the "baggage" based on a history of negative educational experiences. It is absolutely essential to provide a safe, non-threatening atmosphere where risks can be taken with out fear of humiliation or embarrassment.

Environment

Creating a safe environment for learning is a key factor in success. One of the elements that is part of a safe environment is multicultural sensitivity. The following suggestions should be considered as the lessons are delivered:

1. Use multiple instructional strategies to accommodate all learning styles. See *Learning Styles* for more information on this topic. Also see *Teaching Auditory Learners, Teaching Kinesthetic Learners; Teaching Visual Learners.*
2. Avoid ethnocentrism (belief in the superiority of one's own ethnic group), use of stereotypes, critical or judgmental attitudes, fear, and rigid expectations. Strive to address the various cultures represented in the group. Try the AAAA approach to Cultural Diversity: Awareness; Acceptance/Appreciation; Action

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3. Seek to understand the unique motivations of your audience in the workplace. Each worksite has a particular culture. It is important that you strive to understand and become a part of that unique culture.

4. Use materials that are not slanted toward any particular group.

Above all, the instructor must establish a learning environment in which diversity is valued. Students need to feel that their cultural backgrounds are viewed as assets to the class.

Teaching Auditory Learners

(Adapted from materials from presentation, *Designing Workplace Training to Accommodate Culturally Diverse Learners*, Douglas Jones, Linda Mrowicki, Workplace Education Division of THE CENTER-RESOURCES FOR EDUCATION, delivered Jan. 1996.)

Auditory learners learn best by listening to others. They usually do well in a "traditional" classroom.

Audio tapes: Have students or groups listen to a tape or create their own tapes for each other to listen to.

Music: Record key points on an audio cassette with background music. Write a song, rap, jingle or rhyme about the learning material.

Guest speakers: Invite subject matter experts to talk about a topic. This can be outsiders or members of the class.

Reading: Read or tell a story, for variety use music in the background.

Discussions: Use questions to get others in the class involved. Not only can students learn from the instructor, but they can learn by listening to each other, and the instructor can learn from listening to the students.

Repetitions: Repeat things out loud.

Directions: When giving directions, be sure to give them orally.

Mnemonic devices: Mnemonics are artificial aids to memory. The keyword HOMES can be used to remember the names of the Great Lakes; H = Huron O = Ontario M = Michigan E = Erie S = Superior. Sentences and rhymes can also be used; to remember which direction to turn a screw to tighten = Leftie Loosie, Rightie Tightie. Steps in basic division can be incorporated into the sentence: Donald (or Donna) made some candy bars = D = divide M = multiply S = subtract C = compare B = bring down.

Be the Instructor: Pair the class and have one individual teach the other, then reverse roles.

Concert Review: The instructor uses transparencies, pictures, charts, etc. that were used in presenting the lesson as a means of review. While playing soft music, the instructor displays and

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reads the instructional materials. A variation is to have a willing student read the instructional materials.

Oral Cloze: Use oral cloze (fill in the blank) activities to repeat key information

Teaching Kinesthetic Learners

(Adapted from materials from presentation, *Designing Workplace Training to Accommodate Culturally Diverse Learners*. Douglas Jones, Linda Mrowicki, Workplace Education Division of THE CENTER-RESOURCES FOR EDUCATION, delivered Jan. 1996.)

Kinesthetic learners learn best by doing. They like to be physically expressive. They also need to stretch and move periodically. The following are activities that enhance kinesthetic learning.

Walking and studying: Allow students to walk while they study.

Role playing: Use props and costumes while role playing. Can be done with a group or in pairs.

Action learning: Includes anything that requires people to use their bodies in some way while they learn. It could be a song, a dance, a mime, a physical acting out of a technology or process, or an active performance of the learning material where learners become interacting components of the material they are learning.

Strolling review: Have the group prepare colorful flip charts as a means of review. Hang them around the room Play music softly as individuals walk silently around the room, carefully observing the wall display or examining the mind maps created by other learners. A variation is to play music while individuals stroll around and review.

Being the Coach: Ask one partner to be the coach while the other partner learns to perform a new task. After one run, reverse roles.

Demonstrating: Allow class members to demonstrate and physically do an activity. Provide opportunities for practice using repeated motion.

Writing: Writing requires students to use parts of their bodies. Write on surfaces with a finger. Write in the air. Trace on sandpaper. Take notes. Write lists.

Sequencing: Using a topic that has several steps or procedures, give each individual a piece of paper with the words or a graphic depicting one step or procedure. Ask the group to move around until they are in the correct sequence. An option is to act out what is on their piece of paper.

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Teaching Visual Learners

(Adapted from materials from presentation, *Designing Workplace Training to Accommodate Culturally Diverse Learners*. Douglas Jones, Linda Mrowicki, Workplace Education Division of THE CENTER-RESOURCES FOR EDUCATION, delivered Jan. 1996.)

Visual learners like to process, store, and retrieve information visually. The following are examples of activities that instructors can use to facilitate the visual learner.

Demonstrations and modeling: Since visual learners like to understand the "big picture," it is important to show or model all of what is expected before breaking it into its components.

Draw: Simple illustrations can be used to reinforce important information. Encourage students to draw as a means of committing key information to memory.

Imagery: Imagery is the mental visualization of objects, events, and arrays. The typical technique is to ask students to form a mental picture. It usually works best for concrete information and less well for abstract information. Images are better remembered if they are vivid and show some type of movement.

Study Guides: Study guides are used to summarize key information. They are useful for reviewing key points. Instructors can create study guides, or better yet, allow students or groups of students to prepare a study guide.

Graphic organizers: These are visual tools which can show the relationship of categories of information. Charts, graphs, and maps can be used to show relationships visually. They are also good because they usually show or explain a concept holistically. Instructors can create blank charts or matrices for the learner to complete.

Mental Imagery: Have learners rehearse or practice a knowledge base or a skill in their minds.

Mind mapping: Ask individuals to mind map a lecture or presentation, a written lesson, an article, an audio tape, a recollection, an experience, or anything relative to the learning situation that might be significant.

Note taking: Encourage visual learners to take notes using words or pictures. This provides them with another opportunity to visually rehearse the information. Note taking can also be done using a map which allows them to see the "big picture."

Create notebooks: Using notebooks for class projects provides another way for students to see the information in their own words. It allows them to "customize" the information and make it their own.

Color codes: Visual learners like to see different things/views. Use color as a means of focusing attention, or use it as a means of changing the environment to add interest visually.

Study cards: Study cards use the visual sense to present the information. They can be used individually, with partners, or in large groups. Cards can be prepared by the instructor or students can prepare their own.

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Pictures: Watch TV, filmstrips, movies, videos, etc. Another option is to have the group create their own video.

Mnemonics: Create acronyms, draw visual chains, or develop acrostics.

Directions: When giving directions, give them visually.

Tips on Teaching

1. Use logical sequences. Avoid jumping into topics without developing background or relevance for the skill at hand.
2. Control length of lessons into manageable chunks. Many employees come into classes at the end of a long and tiring day. Pace lessons so students can have short breaks.
3. Give recognition and encouragement. It is vial that you recognize and encourage all your students' progress toward their individual goals. Unfortunately, often adult learners are not supported by friends and family who view time spent in class as time taken away from them.
4. Use coaching. Model new skills. Point out the problems or pitfalls many students have with lessons. Repeat explanations several times or a period of time and several ways to accommodate all learning styles. Be there for them.
5. Encourage involvement. Make sure students hear you validate how important it is to learn new skills. Techniques that make provisions for active involvement of students will achieve learning faster than more passive teaching techniques.
6. Give feedback. Adults need to be reassured that they are on track. Give feedback often, and be sure to give negative feedback along with something positive.
7. Use summaries and advance organizers. When materials are detailed or involved, help students see the "big picture."
8. Questions will help you assess how your students are understanding. Make sure they are not accusatory in tone. It is possible to inadvertently press a "hot button" based on a students' unpleasant school memories. Maintain a safe atmosphere for students when questioning them.
    - Direct questions are usually *yes* or *no*, or short answer. They are easy to control.
    - Open-ended questions are more likely to prompt discussion. They are not as easy to control.

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Instructor's Lexicon

The following lexicon is provided to remind teachers that there are a variety of strategies and principles that can be employed in teaching. When you are not getting the response you expect, when faces are blank or bored, when attendance starts to slip--*try something else*.

Anticipation Guides (Readance, Bean, and Baldwin) Prepare students for reading by asking students to reach to a series of statements prepared by the teacher in advance. Expected response is TRUE or FALSE.

Application of concepts to different situations- learning that is applied immediately is retained longer and is more likely to be used immediately than that which is not. Techniques must be employed that encourage the immediate application of any material in a practical way.

Application to individual situation --Provide real life or real work scenarios for which students read different texts to solve problems

Article/pictures

5 W's (Who, What, When, Where, Why/How)
Antonyms/Synonyms
Match or rewrite topics/headlines
Change time, place, people and rewrite
Write questions with higher levels of critical thinking

Brainstorming--All responses are accepted, no judgment. Activates background knowledge. Gets students thinking before they read or write.

Cartoons- students fill in blank balloon with appropriate response

Categorical Overview-- Write down associations , think how they are related, categorize information, and label.

Cloze-- It is a method of systematically deleting words from a prose selection and then evaluating the success a reader has in accurately supplying the words deleted. In a given passage the first and last sentence is provided in tact. Thereafter selected deletions are made. *Ex.* Every 5th or 10th word; Initial/final letter; Word/ phrase; All nouns or verbs, etc.

Clustering-- Similar to mapping, adds visual dimension to the process of organizing ideas, helps students separate ideas into categories. Improves organization of thoughts for speaking or writing.

Coded Vocabulary--Student marks words that he knows with an asterisk, check mark for words he has heard of, and circles the words that he does not know.

Compare and contrast--Write or discuss similarities (compare) and differences (contrast)

Concrete Items/Demonstrations-- Including actual items in classes helps those learners who need more tactile or kinesthetic learning experiences understand. Visual and audio learners have an easier time with traditional formats than other kinds of learners.

Continuum of Descriptors--Write adjectives on a line to show degrees of modification, such as minuscule, tiny, small, average, big, huge, enormous

Cued Retelling (See article on Retelling--Free and Cued)

Cubing--On a paper cube, write down one of the following words on each side of the cube: describe, compare, associate, analyze, apply, argue for. When writing or discussing an object/concept, have students write about it using the suggestions from each side of the cube.

Designated Roles (Cooperative learning)

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Listeners note points of disagreement
" " what is not said
" " questions to ask

DRAT (Directed Reading/Thinking Activity-Haggard, 1985)
Activate prior knowledge
Predict what will be covered
Read to designated point
Confirm, revise, or elaborate prediction with information from text
Continue in similar fashion through text.

Dyads confirm/explain
make decisions
draw conclusions

Find someone who . . . --an ice breaker activity to raise awareness of the depth of experience and diversity in the class. Typically you can only get another person to sign your sheet once. Categories can be as generic as "find someone who has more than 5 brothers and sisters" or "find someone who speaks another language" to class specific information like "find someone who has read a the work of Edgar Allan Poe." It can be designed for many topics but always helps students get comfortable with each other.

Flash card directions--Challenge learners to read more than one word at a time by giving direction quickly on flash cards. Ex. Put your hands on the table.

Free-writing/thinking
Can you think of a time . . .
Questions regarding topic

GIST--requires readers to reduce the first sentence of a passage to 3 or 4 words. The next two sentences to 5 or 6 words. The next three sentence to 7 or 8 words. This requires readers to make meaning and determine their own key words.

INSERT (Interactive Notation System for Effective Reading)--Students place a √, X, +, !, ?, ?? and * besides ideas they read to indicate whether they understand it (√), are excited about it (X), don't understand it (?) , are stumped by it (??), or want to remember it (*).

Interviewing--Encourage students to generate a list of questions that would give them the information they would like to find out about someone. Have students break into pairs and interview their partner, using questions. Then let each introduce his/her partner using the information obtained.

Jigsaw/segmented reading --Instructor assigns parts of a selection to different readers. Readers read their part silently. Each reader shares what they read with group.

Journals--Students write reaction to class, write comments, write questions. Instructor does not judge them on technical competencies. May be used to tie topic of class to learner. If topic is American Education, journal writing questions could be: Where did you go to school? What did you like best in school? What irritated you the most? Why did it irritate you? Who was your favorite teacher? Why did you come to this class?

Key word predicting activity--Instructor selects passage and notes 10 key words. Words are shared with learners who are asked to predict content. Learners should try to make sense of key words. Next, learners read passage and find out if predictions are on target.

K-W-L--(Ogle, 1986) Students identify what they **K**now about a topic , what they **W**ant to find out about a topic, and what they **L**earned about the topic.

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LEA (Language Experience Approach, Stauffer, 1970) Students dictate sentences about an experience as instructor transcribes. This text become the reading material for that student.

Learning style--The 3 major learning modalities:

Visual-needs to see material
Auditory-needs to hear material
Kinesthetic- needs to move around while learning

LINK-- L= List I= Inquire N=Note K=Know List all associations for concept/topic on overhead/chart; inquire - give examples, clarifications about associations; note - write what comes to mind for one minute (overhead off/chart covered); know - what I know now about this concept/topic?

List and skip-- instead of looking up words as you read, use a *List and Skip* bookmark. Write down unfamiliar words from reading selection. After completing selection, look to see if any words were understood through use of context.

Main Idea-- explanation overheard by instructor between students. "How would you tell your mama what the (article, book, chapter) was about if you were calling her long distance?

Mapping (Baumann, 1991)--Arranging key terms into a diagram that is meaningful to the student. It can include the following:

Key words/phrases
Structure
Questions
Connecting lines/circles

Is a graphic representation of the relationship between major ideas and supporting details.

Metacognition - Being aware of how you learn, and the process of thinking through a learning situation. The development of self-questioning or monitoring of patterns of thinking, which helps students become an independent learners who can recognize and correct their processing errors.

Questions with others

What do you think about . . .?
Why is . . . used for . . .?
What would you do if . . .?

Paired Questioning --Divide students into pairs, read passage, close book. Each in turn asks questions with the other answering; tells important ideas; paraphrases or summarizes; agrees/disagrees; draw picture or graphic representation of what learned.

Reading strategies-- Good readers bring what they know about the topic to the print on the page. They are active readers. Good readers take chances, they risk being wrong. Good readers guess at or skip words they don't know and read on for help. Good readers expect the material to make sense. Good readers try to match reading speed to what they are reading.

Reading techniques

see: Flash card directions
see: GIST
see: Key word predicting activity
see: List and Skip
see: Word Bank

Reciprocal questioning

Students work in pairs

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Both read a portion of a reading selection.
One asks the other a question.
Continue reading selection
Alternate asking questions.

Retelling/rewriting- Can be free retellings, cued retellings, and/or cued comprehension questions. Provides an opportunity for students to reflect and revise their thoughts. Teachers can record students thoughts without having to infer right or wrong choices. Possible prompts: *Write down everything you can remember about the selection you just read.* Provide a list of words from the passage, and then, *Use these words to help you remember everything you can about the passage. See Retelling--Free and Cued*

Retelling--Free and Cued - A free retelling allows a reader to structure his or her demonstration of comprehension without the constraints often imposed by a testing situation. If the objective of the assessment is to find out how the student is thinking about the content rather than how much he can demonstrate that he knows, the unprobed (free) retelling is probably the best response.

Researchers find the free written retelling to be an invaluable tool as they explore issues related to reading comprehension. Retellings allow analysis of the link between the response and the original source (the text). Many teachers are reluctant to use them because they do not lend themselves easily to objective scoring.

Since remembering and understanding are not synonymous, there is value to using retrieval cues as an aid to comprehension. By including word or phrase cues the reader has the freedom to indicate his or her comprehension according to personal dictates while simultaneously providing bits of text to help dissolve the confusion between what is understood and what is remembered. **Cued retellings** may be the best of both worlds.

In order to do this form of assessment, the teacher needs to have comprehension questions in mind. the perspectives on comprehension that are to be checked should be noted.

Were the students responses text explicit (Just the facts recited)
Were the responses full of nonessential details? (Not important to understanding the essential message of the passage)
Does the student understand the essence of the passage? (Main idea)

Unless you assess students' comprehension with the intent to learn what students do and do not remember, you can only speculate about their comprehension and the appropriateness of your instructional focus.

Say Something- 2 students read a passage to a designated point Each has to say something about the reading

Segmented reading --see: Jigsaw

Semantic map--see Mapping and **Webbing**

Sequencing--*Paragraphs*

- Articles are cut into parts based on content.
- Student reads each part
- Student orders the parts based on content

Pictures

- Cartoons or picture sequences are cut apart
- Student orders the part based on content

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T Chart -- (Johnson & Johnson)Write the name of a skill to be learned or practiced and draw a large T beneath it. Write "looks like" on the left side of the T and "sounds like" on the right side. On the left side list behaviors that one might see in someone exhibiting this skill. On the right side list phrases that might be used by someone exhibiting this skill.

Think aloud- (Davey)Instructor models and tells the thought process for an instructional piece of material.

Three-way rotation--Three different ways of saying the same thing.

Time line-- Events are placed on a time line to visualize the relationship of events in respect to what else was happening at the same time.

Total Physical Response (Asher)--incorporates listening to directions or commands like, "STAND UP!, SIT DOWN!" and they respond to commands without speaking. Used most effectively in early ESL situations.

Transformation- charts, graphs, maps, forms -learn key idea and transform into different format/media Ex. Act out without words Make a chart or form to explain information to others

Webbing-- Similar to semantic mapping - as a graphic representation of the relationships between major ideas and supporting details. After reading, introduce the central question/idea circled on an overhead or chart. Encourage students to identify supporting secondary ideas, which branch off from the central idea. Supporting details are then supplied for the secondary ideas in a logical fashion.

Word bank--a versatile tool for vocabulary learning. Excellent warm up before reading and writing, assessing prior knowledge. Select a topic related to reading. "When I think of _____ I think of _____" Instructor fills in blanks then asks, "What do you think of? Try to generate 25-50 words per topic.

a. Builds critical thinking skills by clustering words that belong together.
b. Try adding prefixes and suffixes. Discuss how changing the form can change meaning.
c. Focus on spelling; note roots and affixes, number of syllables.
d. Plan a writing exercise. Determine organization according to purpose.
   How to = chronology
   Personal experience = narrative
   Description = topic characteristics.
e. Add vocabulary words as they are discovered through reading or conversation

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Instructor's Role and Responsibilities

There are four main responsibilities in your role as instructor of this class.

1. **Instruction** -- As the instructor you will choose the lessons and gauge the depth of instruction based on the needs of your students and the accomplishment of the objectives.

2. **Assessment** -- This vital part of your role should be handled with great sensitivity. Many adults have not been in a classroom setting for a long time. For some, the testing situation and facing the results of tests is an extremely stressful experience that can cause them to drop out of the class. diffusing the anxiety of the testing situation is a necessary part of your role.

The Pre test should be giving before instruction begins to gauge the level of your students' understanding and prior knowledge of course content. The Post test should be given at the end of instruction. Results should be compared to see if instruction made a difference.

3. **Keeping attendance records** -- In some work situations, attendance is mandatory. In others, employees are paid to attend and accurate attendance records should be maintained.

4. **Other records** -- Anecdotal comments and observations, especial in regard to learning or change, should be documented. Companies and unions are very interested in this kind of feedback and may want to use quotes for recruitment or promotional activities.

This lesson format encourages you to keep notes on how individual lessons worked and what changes might be made to make the lesson more effective to your particular situation.

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Objectives

- To demonstrate mastery of addition, subtraction, multiplication, and division of whole numbers as related to the needs of the company.
- To demonstrate fractions and decimals as related to the needs of the company.
- To understand the calculation of weights as related to the needs of the company.
- To understand the calculation of time as related to the needs of the company.

How these lessons are organized

Objectives for each course have been identified. Lessons have been designed to assure objectives are accomplished. Lessons are designed with a template that has six parts:

I. Understanding/Outcome

II. Materials

III. Demonstration

IV. Exercise / Engagement

V. Workplace Application

VI. Evaluation / Comments

An sample template and explanation of each part follows.

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Explanation of Lesson Format

I. Understanding /Outcome: Focus of the lesson.

II. Materials: What is needed and helpful to do the lesson. Accompanying supplementary materials: Materials supplied or designed to support the lesson.

III. Demonstration	
Activate prior knowledge. The activation of prior knowledge is a critical piece of the Whole Language philosophy. Lessons will always begin with suggestions for activation of prior knowledge, so students can make a connection to their past experience.	Suggested activities. Examples of possible scenarios or questions to initiate discussions. See *Instructor's Lexicon* for an explanation of possible methods.

IV. Exercise/Engagement:	
A step by step procedure for the lesson. Specific activities to engage the students with instructor supervision. The instructor is provided with this framework with the understanding that adaptations may be made to suit the individual or the group.	1. Suggested activities. See *Instructor's Lexicon* to familiarize yourself with the variety of strategies that can be used..

V. Workplace Application: How this new learning, understanding, or concept is applied in the workplace.

VI. Evaluation/Comments: This space is provided for instructor's commentary and/or evaluation of the level of success of the lesson. This may include the duration of time on task, student comments about the lesson, instructor comments about the lesson, and instructor observations on how to improve, expand, or further customize the lesson.. Initially, this information was used to revise and improve pilot lessons for replicable models of instructions. As instruction continues, it is a valuable way for the instructor to keep track of particular strengths or weaknesses of a lesson, things to remember when teaching, etc.

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Planning and Scheduling

Time Requirements

This class is designed to provide approximately 20-30 hours of instruction. The amount of time may vary depending on the entry math skills of participants. Refreshing math skills takes much less time than teaching them to those who never mastered them initially. The format of the course allows the instructor the flexibility to customized lessons to fit the time available. Due to the variability of students' skill levels and interests and company expectations, the instructor must make many decisions on lesson length and inclusion.

Size of class

This course can be adapted to work with any size group. An group of 10-15 is ideal. If a very large number of participants is scheduled, after initial discussions for activation of prior knowledge, smaller groups should be formed so the instructor can facilitate learning and individual needs can be served.

Expected Outcomes

Participants of this class will improve the basic math skills related to their jobs so they can have an understanding of math process needed for their work. For some this may mean understanding how they are paid. For others it may be understanding how to track mileage or time.

Prerequisites

It is assumed that those taking *Numbers at Work* have the reading ability necessary to read the newspaper or popular magazines. Those lacking in reading skills can benefit from the course though the teacher must make certain adjustments for them. It is also assumed that participants have an understanding of addition and subtraction. Though math skills must be refreshed when not used for long periods of time, this course assumes that those in the program will only need a review addition and subtraction. Multiplication and division will be reviewed and taught if needed.

What this course won't do

This class does not address the needs of those who have difficulty understanding English. It is recommended that participants in this category should be encouraged to seek out ABE (Adult Basic Education) programs.

Suggested timing for each lesson

It is difficult, if not impossible, to give time estimates for lessons. The goal is to suit the lesson to the learners needs. The variables on each topic will include the amount of experience and prior knowledge and the skill levels of the participants. Our experience has shown a time range from 20-75 minutes is workable. Some lessons may require several sessions.

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Introduction to Numbers at Work

Everyone uses numbers everyday for many reasons. At work and at home numbers are part of our life. Think of the ways you have used numbers in the last week--tracking time on log sheets, estimating loads on trucks, keeping track of the amount of fuel for trucks or other equipment are common activities at work that include math. Shopping, paying bills, balancing the check book are common activities at home that involve math.

Think of the times you have had to add, subtract, multiply, or divide numbers. Addition, subtraction, multiplication and division are called *math operations* or *basic operations* in math. They are the foundation of all math.

The old saying *if you don't use it, you lose it.* applies to math. This course will give you a chance to review, refresh and may even learn some math skills.

The Daily Math Report has been added to help the instructor understand if the learning is going as planned. It gives you the opportunity to give important feedback to your instructor. Sometimes it is difficult to speak up in a class when something is not clear. This form gives you a chance to tell the instructor exactly what you need so you can understand the lessons.

It is also helpful to write down what you have learned so you can better understand how your learning is taking place. The more involved you are with the learning process, the easier it will be to meet your goal of improving your math skills.

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Whole Language Math Instruction

The Whole Language philosophy advocates instruction based on the learner's experience with numbers and concepts as opposed to teaching skills in isolation with drills and exercises in workbooks. Problem solving is best learned in interactive situations in which the instructor guides the learners as they explore possible problem-solving strategies. Learners develop understandings of math concepts as they become proficient in the language of math though verbal communication, written explanations of answers and problems based on real life situations.

On the other hand, traditional mathematics instruction is based on developing proficiency in computation. A typical lesson begins with the instructor demonstrating the solution for a particular type of problem. After the demonstration, the learners practice by solving similar problems in a work book or on work sheets. The learners' role is to observe the instructor's demonstration and then apply the procedure to the practice problems. Usually students do this independently and interaction between learners is infrequent. Due to the unique situations that may occur in the workplace, we promote using the Whole Language approach. We recognize that traditional methods may be required.

3 C's Comprehend Compute Communicate

(Adapted from Thomas G. Sticht & Barbara A. MacDonald, *Automotive Trandes Information Processing Skills: Mathematics*, Glencoe-Macmillan/McGraw -Hill, New York, 1993)

Comprehend

- Identify the problem to be solved and how mathematics can be used to solve it.
- Identify the numbers that are needed to set up the problems.

Compute

- Decide what operation is needed to do it.
- Predict the outcome. (Will the answer be larger or smaller than the parts?)
- Do the problem.

Communicate

- Communicate the results to others or yourself in writing.

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Math Memories

I. Understanding /Outcome: Building on past experiences to enhance learning

II. Materials: Accompanying supplementary materials: *Math Memories*

III. Demonstration	
Hand out a sample math test and ask students to just LOOK at it a minute or two. Ask them to think about the kinds of feelings that looking at the math test produced.	Suggested activities.

IV. Exercise/Engagement:	
Then pass out *Math Memories* sheet. Ask students to complete the sentences. Be sure to clarify that no names should be put on these sheets because it doesn't matter for this exercise. Once *Math Memories* is completed, collect them and shuffle them and redistribute them so everyone reads someone else's. Put labels for 3 categories on the board; *Positive, Negative,* and *Neutral.* Based on their own experiences and the other sheets they have read, try to categorize the kinds of math experiences the students in the class have had.	1. This activity is designed to deliberately recapture feelings about school math experiences. Most adults in these math classes have had negative experiences The point of this lesson is to help students recognize that they are not alone in their fears and anxieties about math. By encouraging students to attend to their feelings about math instead of avoid them, it is hoped that feelings of isolation will be reduced and group discussion and sharing will be promoted. (Taken from *The Long Road to Exorcism* by Joy Walker, Good Practice, July 27, 1995. http://www.deet.gov.au/pubs//g_p/gp27/story1.htm)

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V. Workplace Application: Opening lines of communication on sensitive issues can enhance learning in many situations.

VI. Evaluation/Comments:

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No name please.

Math Memories

When I think about math, I _____.

The best thing about math was _____.

The worst thing about math was _____.

When it comes to math, I was always _____.

The best math teacher I ever had was _____.

The reason s/he was so good was _____.

The worst math teacher I ever had was _____.

The reason s/he was so bad was _____.

When it comes to math, if I knew then what I know now, I would _____

_____.

Whenever I try to do word problems, _____.

Math has always seemed to be _____.

When it comes to math, the only thing I'm really sure about is _____

_____.

I'd like to learn about _____.

In my life, I need math to _____.

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Keeping Track of Learning

I. Understanding /Outcome: How to use the Math Daily Report

II. Materials: Accompanying supplementary materials: *Math Daily Report*

III. Demonstration	
Activate prior knowledge. Have you ever had to keep track of something over a period of time? (Giving medications to a sick person, tracking the performance of a problem, etc.) What is the value of keeping a written record of a process?	Suggested activities. Give suggestions if there are no responses from the class to the questions. Very early in a class, students may not feel comfortable enough to participate.

IV. Exercise/Engagement:	
Ask students to look over the *Math Daily Report* form . Discuss the way the form will be used in class each session.	Emphasize that this is not an activity or assignment that is being *graded*, it is a tool for gathering feedback. Its purpose is to help the instructor improve the kind and quality of instruction, and individualize for special situations.

V. Workplace Application: Keeping written records of progress is valuable and gives an opportunity to address legibility and completeness in filling out forms.

VI. Evaluation/Comments:

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Math Daily Report

Name: _____ Date: _____ Time _____

Today's topic: _____

What I learned today:

Why do I need to know this?

How did I learn this?

What I need more practice with: _____

What would be helpful for me to learn: _____

I am ready to move on to the next topic. ❒ Yes ❒ No

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Introduction to Math Operations

I. Understanding /Outcome:
The use of numbers in the workplace and daily life--practical applications of basic math operations.

II. Materials: Checkbook, calendar, ruler, catalogue, menu, grocery store advertisement, work-related forms, clock, etc. Chalk board, pencils and paper.

III. Demonstration	
Activate prior knowledge. 1. Introduce use of numbers in daily life. 2. Discuss ways of using number operations during the day--when do you have to add, subtract, multiply or divide?	Suggested activities. 1. Display assorted items. "In what ways have you had to use numbers in the past 24 hours (or week)?" 2. Discuss and list on board, "What did you have to do with these numbers?" Possible responses are count, check date, pay for groceries, fill up gas tank, calculate miles per gallon, etc.

IV. Exercise/Engagement:	
1. Identify basic operations and provide examples of using each operation. 2. Have students decide if they would like to spend time reviewing the 4 operations. 3. Discuss the most common problems with each operation.	1. What math operations did you use in the last week? 2. With a partner, list as many ways as you can think of that you use math. 3. Students may not speak freely about math deficiencies in a group. Give them an opportunity to write about math experiences or

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4. Pretesting basic operations helps students better assess their math skills. 5. Fill out *Math Daily Report*	frustrations in their journal so math instruction can be individualized.

V. Workplace Application: Employees must use basic math operations to complete forms at work and function in everyday life (balance checkbook, figure tips, etc.).

VI. Evaluation/Comments:

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Name:_____ Date: _____

Number Chart -- Fill in the numbers from 0 to 99.

	1	2	3				7	8	
10		12		14	15	16			
	21	22	23				27	28	
30				34	35	36	37		
			43	44			47	48	49
50	51	52	53		55				
					65	66	67	68	69
		72	73	74	75				79
	81					86	87	88	89
		92	93	94	95	96			

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Monthly Calendar

Name: _____

Month: _____

Write the numbers of the month in the corners of the boxes.

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Whole Number Practice

Add the following:

1.
10
9
8
+ 11

2.
2 hr. 9 min.
1 hr. 12 min.
6 hr. 31 min.
+ 3 hr. 6 min.

3.
44
43
51
+ 39

4.
8 hr. 42 min.
9 hr. 14 min.
10 hr. 21 min.
11 hr. 3 min.
+ 9 hr. 39 min.

5.
383
558
214
+ 635

6.
$685
378
298
+ 419

7.
496
545
339
+ 108

8.
8,613
8,000
9,678
3,159
+ 2,718

9.
41,263
87,190
36,850
23,367
+ 70,201

10.
$82.
74.
96.
102.
+ 89.

11.
48,152 lb.
52, 456 lb.
39, 874 lb.
41, 974 lb.
+ 47, 327 lb.

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Subtract

1. 71
- 38

2. $807
- 216

3. $4,930
- 1,038

4. 5,671
- 1,084

5. $67,592
- 48,111

6. 65,758 lb.
- 26,946 lb.

7. 54 hr. 29 min.
- 2 hr. 31 min.

8. 61,287 lb..
- 20,698 lb.

9. $212.48
- 11.54

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Changing Units

You need to know something about units of measure to figure out how many total hours you worked, to decide how many gallons of paint you need to paint your house, or to come up with how much fencing you need to fence your yard.

You don't need to memorize the *table of measurement*, but you need to know how to use it. Abbreviations for each measurement are given in (parentheses).

Table of Measurements		
Time Measures		
1 minute (min.)	=	60 seconds (sec.)
1 hour (hr.)	=	60 minutes (min.)
1 day (da.)	=	24 hours (hr.)
1 week (wk.)	=	7 days
52 weeks (wk)	=	1 year (yr.)
365 days	=	1 year (yr.)
Weight Measures		
1 pound (lb.)	=	16 ounces (oz.)
1 ton (T.)	=	2,000 pounds
Liquid Measures		
1 cup	=	8 ounces (oz.)
1 pint (pt.)	=	16 ounces (oz.)
1 pint (pt.)	=	2 cups
1 quart (qt.)	=	32 ounces (oz.)
1 quart (qt.)	=	4 cups
1 gallon (gal.)	=	4 quarts (qt.)
Length Measures		
1 foot (ft. or ')	=	12 inches (in. or ")
1 yard (yd.)	=	36 inches
1 yard (yd.)	=	3 feet

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Adding Units of Measure

When adding units of measure:

1. Add each unit of measurement separately

Example
3 hr. 15 min.
+ 8 hr. 55 min.
11 hr. 70 min.

2. If you have enough of a small unit to change it to a larger unit, do it by subtracting.

70 min.
(1 hr.) — 60 min.
10 min.

3. Add the larger unit to the total. 11 hr. 70 min. = 12 hr. 10 min.

Add the following units of measure.

1. 2 hr. 38 min.
+ 6 hr. 47 min.

2. 2 gal. 3 qt.
+ 5 gal. 3 qt.

3. 4 lb. 12 oz.
+ 7 lb. 11 oz.

4. 3 da. 18 hr.
+ 8 da. 16 hr.

5. 8 ft. 4 in.
+ 3 ft. 11 in.

6. 10 min. 15 sec.
+ 5 min. 52 sec.

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Subtracting Units of Measure

Example:

7 hr. 35 min.
- 4 hr. 50 min.

Since you can't subtract a larger number from a smaller number, you must borrow. Check the *Table of Measurement* if you don't know how many smaller units are in a larger unit.. Borrow one larger unit changed to smaller units (1 hr. = 60 min.) and add it you already have.(60min. + 35 min. = 95min.)

^{6} ^{95}
7 hr. 35 min.
- 4 hr. 50 min.
2 hr. 45 min.

Subtract the following units of measure.

1. 6 hr. 12 min.
- 1 hr. 55 min.

2. 45 hr. 50 min.
- 3 hr. 55 min.

3. 51 hr. 27 min.
- 2 hr. 33 min.

4. 8 ft. 5 in.
- 4 ft. 8 in.

5. 13 lb. 8 oz.
- 10 lb. 14 oz.

6. 5 yd.
- 2 yd. 2 ft.

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Multiplying Units of Measure

1. 16 min.
   x 4

2. 36 min.
   x 7

3. 1 hr. 12 min.
   x 6

4. 289
   x 98

5. 8,736
   x 605

6. 2,671
   x 800

7. 2,000
   x 701

8. 9503
   x 41

9. 10000
   x 100

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Dividing Units of Measure

The division sign -:- is read ***divided by.***

1. 36 -:- 12 =

2. 57 -:- 19 =

3. 720 -:- 36 =

4. 26,010 -:- 45 =

5. $1,288 -:- 43 hr. =

6. 1,048 -:- 51 hr. =

7. $1,248 -:- 42 hr. =

8. 1,272 -:- 54 hr. =

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Place Value

I. Understanding /Outcome: Place value is critical to understanding whole number operations: addition, subtraction, multiplication, and division.

Materials: Tally sticks for ones, tens, hundreds, rubber bands, Handout: *Place value chart*

III. Demonstration	
Activate prior knowledge. Discuss need for getting in the right line or place. Discuss need for being in the right place.	Suggested activities: 1. Did you ever get in the wrong line when waiting for something (getting tickets, waiting for rides at an amusement park)? 2. Did you ever have to add a column of amounts of money and the numbers were not lined up? (Keeping track of expenses on a trip)

IV. Exercise/Engagement:	
This very basic place value exercise should be used only if students demonstrate they have no concept of place value.) 1. Use tally sticks to show place value. 2. Discuss and write random numbers, indicating place value of number. (Use single and double digit numbers with tally sticks)	1. In pairs have students count out 12 sticks, putting a rubber band around 10 showing 1-ten and 2-ones. 2. Continue showing numbers with tally sticks and have students write numerals.

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3. Review place value chart	3. Emphasize the need for zero as a place holder writing numbers.
4. Give several examples of whole and decimal numbers.	4. 42, 103, 1.5, 15.3 1002, 10.02

V. Workplace Application: Place value is basic to understanding all math operations used in the workplace.

VI. Evaluation/Comments:

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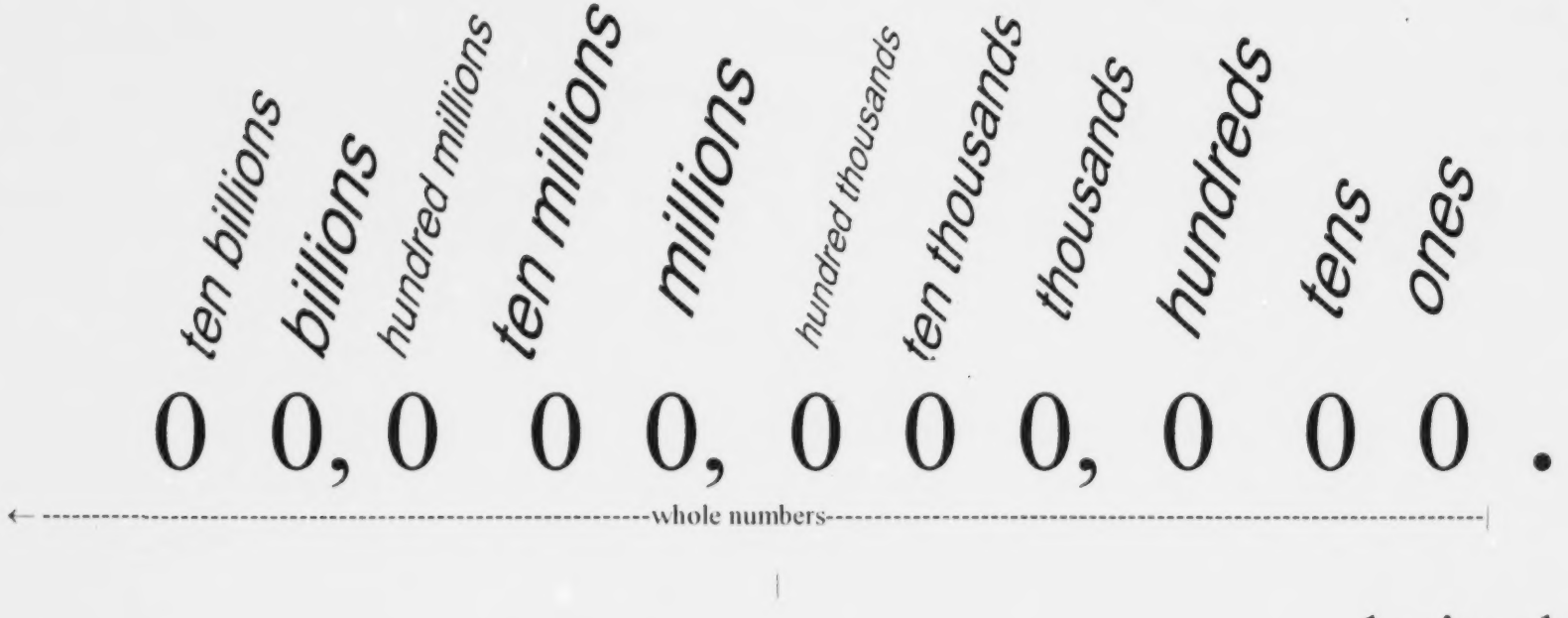
Whole Number Place Value Chart



Place Value Work Sheet

Name: _____ **Date:** _____

Directions: Arrange the numbers from the smallest to the largest order on the blanks and in the boxes.

1. 1, 356
2. 763
3. 1,742,975
4. 9
5. 6,532,648
6. 36
7. 2,189
8. 400, 434
9. 56,719
10. 4
11. 27,674
12. 881,802

MILLIONS	HUNDRED THOUSANDS	TEN THOUSANDS	THOUSANDS	HUNDREDS	TENS	ONES
						—
						—
					—	—
				—	—	—
			—	—	—	—
			—	—	—	—
		2	7	6	7	4
		—	—	—	—	—
	—	—	—	—	—	—
	—	—	—	—	—	—
—	—	—	—	—	—	—
—	—	—	—	—	—	—

MILLIONS	HUNDRED THOUSANDS	TEN THOUSANDS	THOUSANDS	HUNDREDS	TENS	ONES
		2	7	6	7	4

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Rounding Off Numbers

I. Understanding /Outcome: How to round off numbers to a designated place.

Materials: Blackboard, chalk, hand out, paper, pencils, journals Handout:

III. Demonstration	
Activate prior knowledge. 1. Introduce the need for rounding off numbers.	Suggested activities. 1. "If I were pricing a new house that I was interested in buying, I wouldn't tell you it cost $98, 694.26. I would more likely say it was nearly 99 thousand or about 100 thousand." Can you think of other examples of simplifying an exact number? (Federal budget, large hospital bill, estimating cost of home repairs or home improvement.)

IV. Exercise/Engagement:	
1. Provide numbers for learners to round off to a designated place from work or home context. 2. Complete the hand out if concept is unclear or more practice is needed.	1. On the board, write numbers and discuss where they should be rounded off: to the nearest 10, 100, 1000, etc. 2. As a group or in pairs, provide numbers to be rounded off to the nearest _____. 3. Have learner explain procedure for rounding off numbers. 4. Write explanation of process of

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	rounding off in daily log.

V. Workplace Application: Rounding off numbers is a skill needed in some work -related calculations like estimating the weight of loads on a truck.

VI. Evaluation/Comments:

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Rounding off numbers

We round off numbers to make them easier to understand or when accuracy is not necessary. Auto manufacturers publish reports of the number of cars sold in a given time with rounded off numbers.

If 12,624,723 cars were sold in a 6-month period, the number may be rounded off to the nearest hundred thousand -- 12,600,000.

To round whole numbers, follow these steps:

Underline the number in the place you are rounding.
12,624,723 (6 is in the hundred thousand place)

Look at the number in the next place to the right of the underlined number. 12,624,723 (2 is next to the underlined number in this example.)

If the number to the right is less than 5, leave the underlined number as it is. (2 is less than 5)

If the number to the right of the underlined number is 5 or more, add 1 to the underlined number.

Change all numbers to the right of the underlined number to zero.

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Rounding off numbers work sheet

1. Round to the nearest 10:

78 _____	53 _____	45 _____
32 _____	985 _____	817 _____
897 _____	432 _____	911 _____

2. Round to the nearest 100:

3,124 _____	6,598 _____	2,912 _____
8,555 _____	8,499 _____	4,150 _____

3. Round to the nearest 1000:

23,798 _____	65,073 _____	98,186 _____
67,599 _____	41,008 _____	99,199 _____

4. Round to the nearest 10,000:

123,456_____	456,987_____	983,129_____
793,108_____	497,296_____	928,376_____

5. Round to the nearest 100,000:

1,497,387 _____	109,477,498_____
8,399,832 _____	986,399,737_____
4,783,925 _____	843,399,000_____

6. Round to the nearest 1,000,000:

123,995,884 _____	165,376,984 _____
974,538,883 _____	170,802,840 _____

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Work Related Rounding off Examples:

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Using a calculator to check your work

I. Understanding /Outcome: Understanding how to use a calculator to check your work.

Materials:

III. Demonstration	
Activate prior knowledge. 1. How many people use calculators regularly? At work? At home? 2. What happens when you use a calculator all the time?	Suggested activities. 1. Find out how many use calculators regularly and the situations when they use them. 2. A certain dependency results from not using your mind to do math. You may actually become much slower at math calculations in your head.

IV. Exercise/Engagement:	
1. Go over basic features of simple calculators. Discuss the problems of using a calculator without having a general idea of what the answer should be.	

V. Workplace Application: Calculators are available in the workplace and an understanding of using one to check work can improve speed and accuracy.

VI. Evaluation/Comments:

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Introduction to Decimals

I. Understanding /Outcome:
Understanding the concept of decimals: how to read and write decimals.

Materials: Dollars, pennies, nickels, dimes, quarters, half dollars, completed time sheets, decimal place value chart, pencils, paper.

III. Demonstration	
Activate prior knowledge. Introduce the concept of decimals.	Suggested activities. 1. If you wrote a check for groceries for $42.36 (write on board), how would you know which numbers represented dollars and which numbers represented cents? (The decimal point separates whole numbers from parts of a whole.) 2. Where else do you use decimals? (Time sheets, checkbook, metric measurements, etc.)

IV. Exercise/Engagement:	
1. Determine place value of numerals with decimal point. 2. Read and write decimals. 3. Discuss decimals used in the workplace. How do different jobs use decimals? 4. The most important point to bring out of the discussion	1. Using real dollars and coins, have learners write the amount of money shown. Explain the value of each number written. Use place value chart to reinforce the concept of decimal place value.

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on working with decimals is to line up the decimal points when adding and subtracting using zeros for place holders if desired. The most important thing when multiplying decimals is to count the number of places and put the decimal point in the proper place. The most important thing when dividing decimals is to move the decimal point the proper number of places to the right.	

V. Workplace Application: Decimals are used on SPC charts, metric measurement, and in daily life situations.

VI. Evaluation/Comments:

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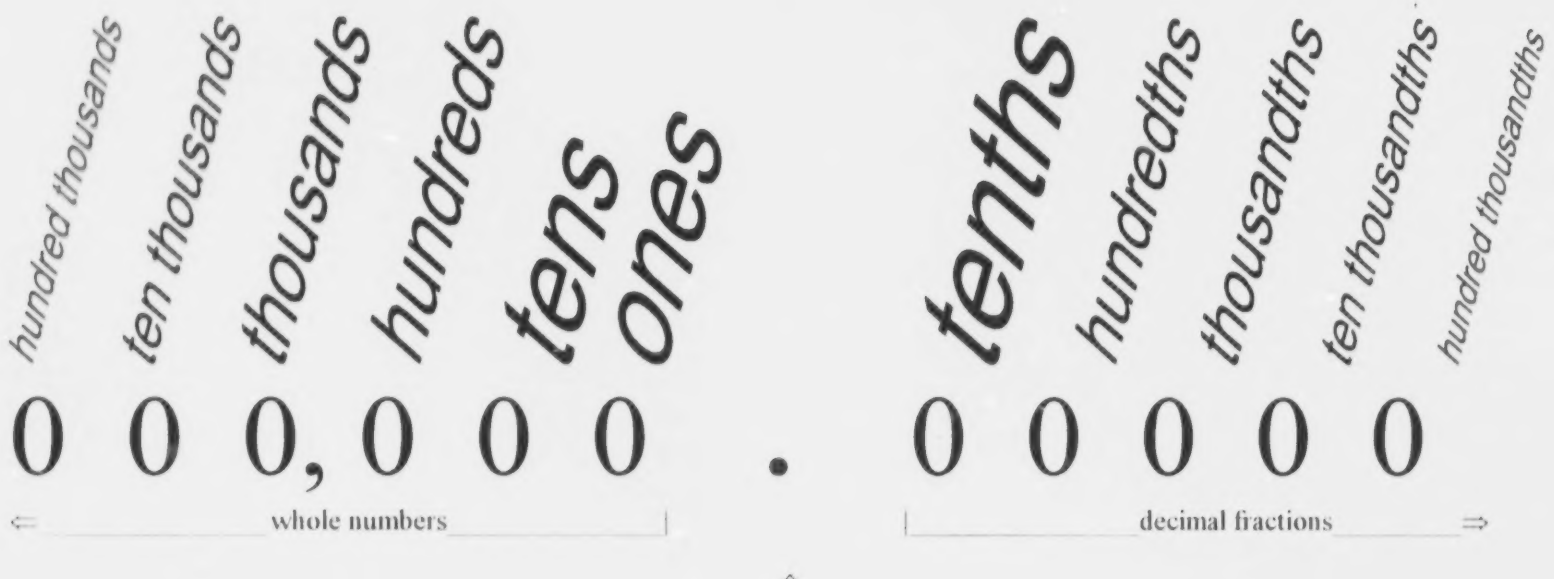
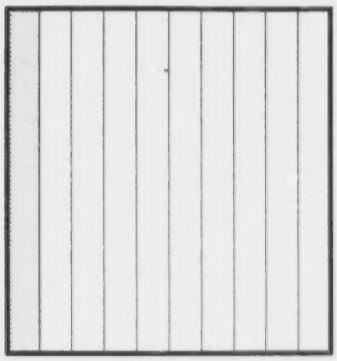
Place Value


hundred thousands
ten thousands
thousands
hundreds
tens
ones
tenths
hundredths
thousandths
ten thousandths
hundred thousandths
0 0 0, 0 0 0 . 0 0 0 0 0
whole numbers
decimal fractions
decimal point

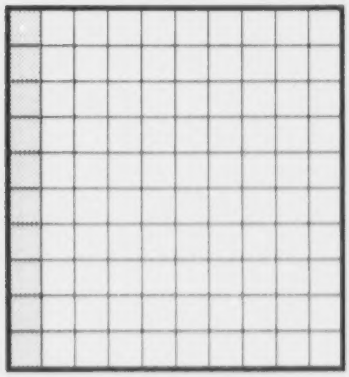
Money and Decimals Work Sheet

Name: _____ **Date:** _____



This square is divided into tenths.

1. What decimal is represented by the shaded bar? _____



This square is divided into hundredths.

2. What decimal is represented by the shaded bar? _____

3. What coin in our money system represents .1 ($\frac{1}{10}$) of one dollar? _____

4. What coin in our money system represents.01 ($\frac{1}{100}$) of one dollar? _____

5. What coin represents .25 of one dollar? _____

6. How many tenths of a dollar are there in fifty cents? _____

7. How many hundredths of one dollar are there in fifty cents? _____

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Write the following amounts as a decimal.

8. thirty seven cents _____

9. nineteen cents _____

10. eight cents _____

11. seventy five cents _____

12. eighty six cents _____

13. twenty nine cents _____

14. three cents _____

15. fifty two cents _____

16. forty cents _____

17. ten cents _____

18. one cent _____

19. ninety six cents _____

20. one dollar and twenty six cents _____

21. In $5.72, in what place is the 7? _____

22. In $4.95, in what place is the 5? _____

23. In $109.83, in what place is the 0? _____

24. In $14.86, in what place is the 4? _____

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Math Operations With Decimals

Remember to line up the decimal points.

Add the following:

1. 6.1 + 2.5 + 4.6 =

2. 634.1 + 4.1 + 796.1 =

3. .61 + 3 + 2.8 + 743.1 =

4. 26 + 7.1 + .05 + .0071 =

5. 6.7 hr.. + 7 hr. + .6 hr.. =

6. 8.1 hr.. + 9.5 hr.. +9.1 hr.. +8.75 hr.. + 8.4 hr.. =

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Add the following decimals.

1. 6.80
+.02

2. 3.4
+ 1.7

3. 2.06
+ 1.1

4. 4.7
.01
.002
+ 3.0

5. 8.71
.121
+ 1.60

6. 5.2
7.5
+ 10.9

7. 6.1 hr.. + 10.8 hr.. + 9.3 hr.. =

8. 11.6 hr.. + 10.5 hr. + .8.3 hr.. =

9. 4.062 + 2.2 + .007 =

10. .386 + .002 + .593 =

11. 916.3 + 20.6 + .66 =

12. 4.7 + 1.96 + .001 =

13. .006 + 46 + 2.2 =

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Subtract the following decimals:
(Be sure to line up the decimal points.)

1. 6.71 - .50 =

2. 38.7 hr.. - 2.2 hr.. =

3. 47.6 hr.. - .40 hr.. =

4. 43.7 hr.. - .9 hr.. =

5. 64.7 hr.. - .75 hr.. =

6. 1267.83 - 946.32 =

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Subtraction of decimals (Remember to line up the decimal points.)

1. 9.6 - .002 =

2. 4.76 - 1.25 =

3. 15.6 - 3.3 =

4. 106.78 - 9.9 =

5. 387.1 - 132.26 =

6. .0934 - .0012 =

7. .65 - .347 =

8. 967.95 - 2.56 =

9. .73 - .28 =

10. .06 - .059 =

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Multiply the following decimals:
Be sure you count the number of decimal places in the answer and put the decimal point in the right place.

1. 13.7
X 6.7

2. .36
X 2.6

3 .71
X .86

4. .893
X .003

5. 783
X .023

6. .471
X .001

7. 8.1
X 2.5

8. 2.6
X 1.7

9. 11.9
X .03

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10. 41.7 hr.. X $11.21 =

11. 54.3 hr.. X $14.51 =

12. 67.5 hr.. X $12.01 =

13. 43.1 hr.. X $10.82 =

14. 33.6 hr.. X $14.02 =

15. 52.8 hr... X $16.36 =

16. 63.5 hr.. X $13.27 =

17. 48.7 hr.. X $15.13 =

18. 65.1 hr.. X $12.32 =

19. 54. 7 hr.. X $10.72 =

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Divide the following decimals:
(The division sign **-:-** is read ***divided by.***)

1. $742.95 -:- 42.3 hr.. =

2. $832.43 -:- 47.5 hr.. =

3. $852.81 -:- 41.3 hr.. =

4.. $984.52 -:- 45.2 hr.. =

5. $966.54 -:- 51.2 hr.. =

6. $714.21 -:- 39.9 hr.. =

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Divide the following decimals.

(The division sign -:- is read ***divided by***.)

1. .06 -:- 2 =

2. 6 -:- .02 =

3. .06 -:- .02 =

4. 3.60 -:- .06 =

5. .360 -:- .006 =

6. 19.88 -:- .28 =

7. 2.346 -:- 5.1 =

8 360 -:- .9 =

9. 2.39 -:- 2.3 =

10. 74.8 -:- .44 =

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Using decimals in work situations

1. A crate manufacturer uses wood that is 2.5 mm thick. To save money he plans to use wood that is 1.75 mm thick. How much thinner will the new wood be?

2. A worn floor at the plant must be covered with 1.5 inch plywood and another layer of .75 inch fiberboard. How thick will the new flooring be?

3. The odometer on Chris's car showed that one route to work was 7.7 miles round trip. Another route was 8.3 miles round trip. What is the difference in miles between routes for a 5 day work week?

4. A sign on a truck delivery door says, "Height limit = 11.5 feet." Sam's truck measures 11.2 feet tall when the tires are low. When the tires are full the truck is another 0.3 feet higher. Does Sam's truck clear the doorway when the tires are full?

5. By how much does Sam's truck clear the doorway when the tires are low?

6. Terry drove for 2.5 hours at an overage speed of 70 mph and for 1.5 hours at an average speed of 50 miles an hour. What is the total of the miles driven?

7. Robert filled up his truck with 40.7 gallons of gas each day for 5 days. What is the total amount of gas did he put in his truck?

Answers: 1. .75 mm thinner 2. 2.25 inches thick 3. 3 miles difference 4. No, the truck measures 11.5 feet. 5. The truck clears the door by .03 feet. 6. 250 miles 7. 203.5 gal.

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Changing Time to Decimal Equivalents

I. Understanding /Outcome: How to change minutes to decimal equivalents of an hour.

II. Materials:
Accompanying supplementary materials: *Sample time sheets*

III. Demonstration

Activate prior knowledge.	Suggested activities.
1. Most units can be divided into smaller pieces. Can an hour be divided into smaller pieces? 2. Do we express parts of an hour by fractions? (Half, quarter, third, twelfth, etc.) 3. Since all fractions have decimal equivalents, it is the process of converting a fraction to a decimal.	At some companies, time is calculated with decimal equivalents of an hour since it is much easier to compute. Find out if this is the case at your site. If so, proceed with the lesson. If not, skip this lesson.

IV. Exercise/Engagement:

1. One minute is what fraction of an hour? ($\frac{1}{60}$) 2. What is the process for changing a fraction to a decimal? (Dividing the numerator by the denominator.) 3. Demonstrate one example for the class. 4. Answer questions. 5. Distribute the *Decimal Equivalents of an Hour* work sheet.	1. Hand out clock worksheet.

V. Workplace Application: Understanding how minutes of an hour are calculated in decimal equivalents is necessary for calculating pay at some companies.

VI. Evaluation/Comments:

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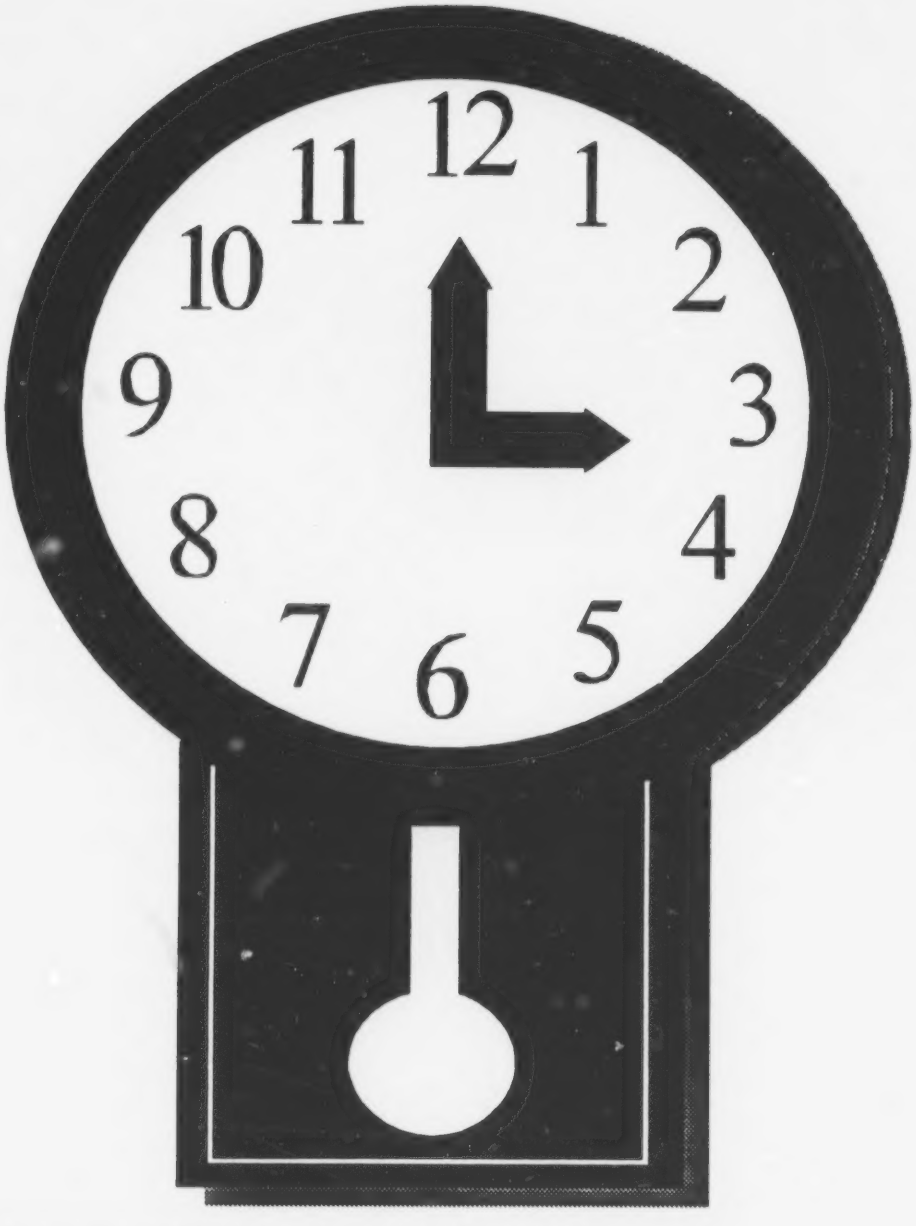

How many minutes are there in half an hour?_____

How many minutes are there in a quarter of an hour? _____

How many minutes are there in $\frac{1}{12}$ of an hour? _____

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Decimal Equivalents of an Hour Work Sheet

1 hour = 60 minutes = 1.00

5 minutes = $\frac{5}{60}$ = _____

10 minutes = $\frac{10}{60}$ = _____

15 minutes = $\frac{15}{60}$ = _____

20 minutes = $\frac{20}{60}$ = _____

25 minutes = $\frac{25}{60}$ = _____

30 minutes = $\frac{30}{60}$ = _____

35 minutes = $\frac{35}{60}$ = _____

40 minutes = $\frac{40}{60}$ = _____

45 minutes = $\frac{45}{60}$ = _____

50 minutes = $\frac{50}{60}$ = _____

55 minutes = $\frac{55}{60}$ = _____

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Calculating your pay

I. Understanding /Outcome: How to calculate pay based on company policies.

II. Materials: Accompanying supplementary materials: *Sample pay sheets or time sheets*

III. Demonstration	
Activate prior knowledge. 1. Discuss how different employees' pay is calculated. For some it is a straight hourly rate. For others it is by the job, or load. For some, there are complex formulas to apply to determine rate of pay. 2. Determine the overtime policy in regard to the employees in your class. 3. Ask them to give examples of the kind of deductions that are made from their pay.	Suggested activities.

IV. Exercise/Engagement:	
1. Write out a scenario for pay using the criteria set by your site. Give employees realistic examples of what they can expect to see on their pay stubs. 2. If possible, copy a pay stub and white out identification and discuss all of the terms on the stub. 3. Write out possible scenarios for employees to practice calculating.	1.

V. Workplace Application: Understanding how pay is calculated is empowers employees.

VI. Evaluation/Comments:

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Calculating Pay Work Sheet

	$41.50 Load A	$54.98 Load B	$39.56 Load C	Clock Hours	Down Time -15	Production Hours
Monday						
Tuesday	1		2			
Wednesday			4			
Thursday	1		2			
Friday	1		2			
Saturday			2			
Total						

3 Load A X $41.50 = $124.50

0 Load B X $54.98 = 0

12 Load C X $39.56 = $474.72

Total of all Loads: $124.50

+ 474.72

$599.22

Total of all Loads -:- Production Hours = Hourly Rate

Hourly Rate X 40 hours

Overtime = Hourly rate X 1.5 (Time and a half)

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	$41.50 Load A	$54.98 Load B	$39.56 Load C	Clock Hours	Down Time -15	Production Hours
Monday						
Tuesday	1		2			
Wednesday			4			
Thursday	1		2			
Friday	1		2			
Saturday			2			
Total						

	$41.50 Load A	$54.98 Load B	$39.56 Load C	Clock Hours	Down Time -15	Production Hours
Monday						
Tuesday						
Wednesday						
Thursday						
Friday						
Saturday						
Total						

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Rounding Decimals

I. Understanding /Outcome: How to round decimals.

II. Materials: Accompanying supplementary materials: *Rounding Decimals*, *Rounding Decimals Worksheets*

III. Demonstration	
Activate prior knowledge. Tell me what you remember about rounding off numbers. Why is it important to know how to round off decimals?	Suggested activities. When working with calculators, sometimes answers can have many decimal places that are unnecessary.

IV. Exercise/Engagement:	
Rounding decimals is basically the same process as rounding whole numbers. Review with examples. Hand out *Rounding Decimals* and the worksheets for reinforcement.	1.

V. Workplace Application: Understanding how to round decimals is necessary for estimating in some work situations.

VI. Evaluation/Comments:

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Rounding decimals

To round a decimal is to shorten it or make it easier to read. This is done by discarding the digits (numbers) that are not needed.

Example 1: Eric ears $7.68 for each hour of overtime he works. How much will he earn in 2.4 yours of overtime on Saturday?

Step 1: Solve the problem

$7.68

x 2.4

3072

1536

$18.432 Note that there are 3 decimal places in the answer.

Step 2: To write $18.432 as dollars and cents, we want to keep only 2 digits (numbers) to the right of the decimal point. Because 2 is less than 5, we drop the number and leave the answer as 43 cents.

If the number was 5 or more, you would drop the number and raise the digit to the left by one.

Example: $18.466 would be rounded to $18.47.

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Rounding decimals worksheet

1. Round to the nearest tenth:

0.32 _____ 0.67 _____ 0.65 _____ 0.81 _____
0.94 _____ 0.58 _____ 0.76 _____ 0.59 _____

2. Round to the nearest one hundredth:

0.321 _____ 0.679 _____ 0.652 _____ 0.818 _____
0.943 _____ 0.587 _____ 0.764 _____ 0.595 _____

3. Round to the nearest thousandth:

0.32191 _____ 0.67982 _____ 0.65237 _____
0.81862 _____ 0.94344 _____ 0.58799 _____
0.76469 _____ 0.59527 _____ 1.38585 _____

4. Round to the nearest ten thousandth:

0.32191 _____ 0.67982 _____ 0.65237 _____
0.81862 _____ 0.94344 _____ 0.58799 _____
0.76469 _____ 0.59527 _____ 1.38585 _____

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Finding an Average

I. Understanding /Outcome: How to find the average of a sum of numbers.

II. Materials: Accompanying supplementary materials: *Finding an average or mean, Practice finding averages*

III. Demonstration	
Activate prior knowledge. 1. What is an *average*? 2. What are some examples of averages in everyday life? 3. What is a *mean?*	Suggested activities. 1. Define the term average by getting responses from the group. 2. List responses from group. (Batting averages, average temperatures, test scores in school, etc.) 3. Make sure participants understand that the terms *mean* and *average* are interchangeable.

IV. Exercise/Engagement:	
1. What is the reason for calculating averages? 2. What do you need to know to calculate an average? 3. When are averages used at work? Are they used to track performance and make predictions? 4. Practice averaging sets of data. 5. Elicit scenarios from the workplace to use as examples for practicing finding an average.	1. In many cases it is to track performance and make predictions as in the weather and sports. 2. Try to elicit the *total* of a set of data and the *number of sets* that are in the total. 3. Elicit responses. 4. Refer participants to the *Finding the Average or Mean* 5. For extra practice, see the practice sheet.

V. Workplace Application: Finding the average is a necessary skill in some workplace calculations.

V. Evaluation/Comments:

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Finding the Average or Mean:

The **average** or **mean** is a good measure to describe the middle amount of a set of data. To find the **average** or **mean,** divide the total by the number of parts.

Example: A truck stopped 4 times to pick up loads. The first load weighed 24,000 lb.; the second load weighed 18,000 lb.; the third load weighed 16,000 lb.; the fourth load weighed 26,000 lb. What was the average weight of the loads?

24,000 First, find a total of the loads. In this case, the total weight

18,000 of the 4 loads picked up.

16,000

\+ 26,000 lb.

84,000 lb.

Next, divide the total by the number of sets of data. In this case, the total is divided by 4, since there were 4 loads that were picked up.

84,000 lb. -:- 4 = 21,000 lb.

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Practice finding averages

1. Tim worked the following hours last week.

Monday	8.5
Tuesday	10. 75
Wednesday	8.7
Thursday	11.25
Friday	9.75

What was his average for the week?

2. On her delivery route, Debbie used 8 gallons of gas on Monday,
10 gallons of gas on Tuesday,
9 gallons of gas on Wednesday,
14 gallons of gas on Thursday,
and 8 gallons of gas on Friday.

What was the average amount of gas used daily?

3. The Advise Company had sales of $103 million in 1990, $142 million in 1991, $98 million in 1992, $112 million in 1993, $138 million in 1994, and $156 million in 1995.

What is their average sales from 1990 to 1995?

What is their average sales from 1990 to 1992?

What is their average sales from 1993 to 1995?

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upplementary Lessons

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Introduction to Fractions

I. Understanding /Outcome:
Fractions are parts of a whole; understanding the numerator and denominator.

Materials:
Pita bread (one for each), apples, whole graham crackers, knives, or cardboard circles and scissors.

III. Demonstration	
Activate prior knowledge. 1. Introduce the concept of breaking a whole into parts.	Suggested activities. 1. When you get a pizza, it is usually cut into equal slices. If you have a pie or cake, how is it usually divided? (Equal parts) 2. What other things are usually divided into equal parts?

IV. Exercise/Engagement:	
1. Give hands on experience with dividing wholes into fractional parts.	1. Give each pair of learners a pita, apple, graham cracker, and a knife. Have them divide the whole items into equal parts. With each divided item, have them indicate the whole (ex. 4/4) and parts of a whole (ex. 3/4).
2. Discuss the concept of *fraction*-- parts of whole.	2. How would you write the number to show a part of the whole?
3. Introduce *numerator* and	3. Explain that the numerator tells

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denominator. 4. A discussion of equivalent fractions may follow to show that 2/4 is equal to 1/4 or 4/8. 5. Discuss when employees use fractions in the workplace.	how many parts and the denominator shows how many parts the whole was divided into.

V. Workplace Application: Understanding fractions is necessary in reading measurements and other workplace applications.

VI. Evaluation/Comments:

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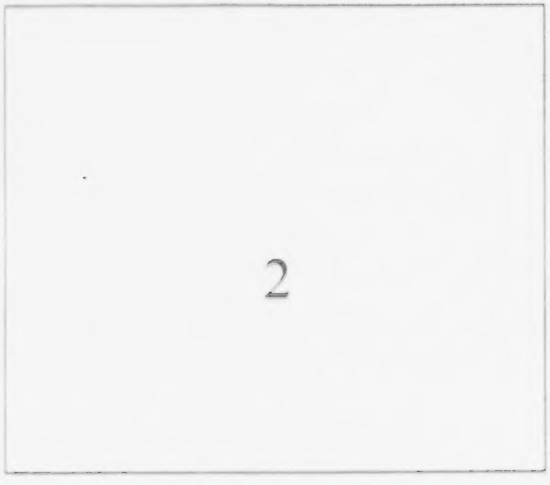
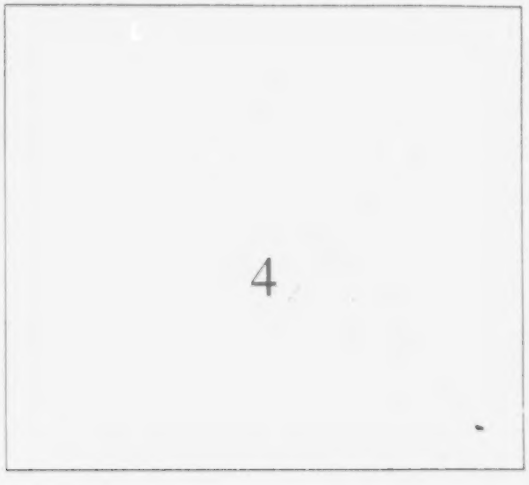
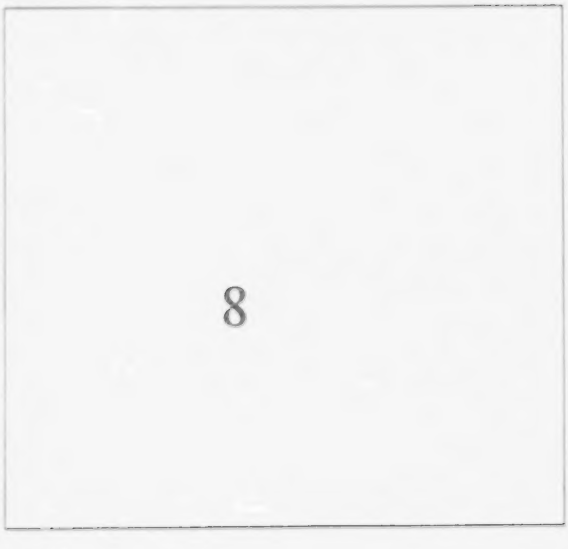
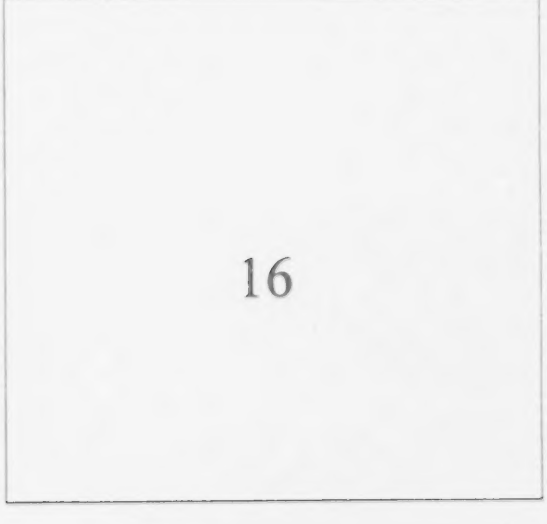
Fractions

Divide the boxes below into the number of equal parts stated in the box.









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Fractional equivalents: Using the boxes on the last page, answer the following questions.

1. How many fourths are there in one half? _____

2. How many eighths are there in one half? _____

3. How many sixteenths are there in one fourth? _____

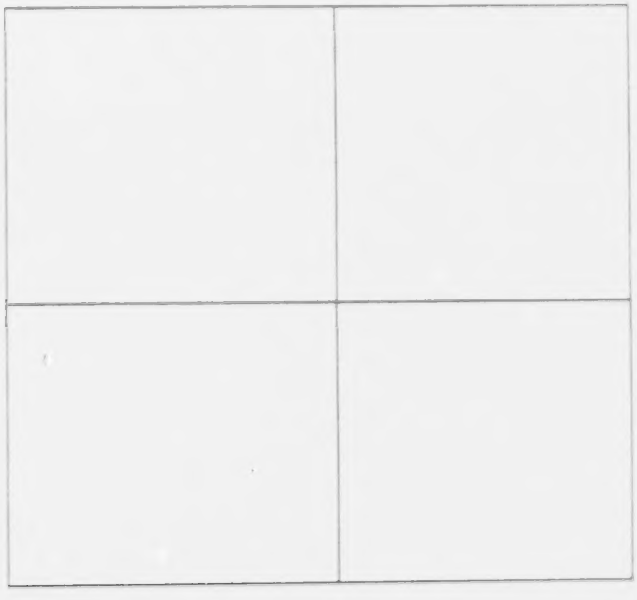
4. How many sixteenths are there in three fourths? _____

5. How many sixteenths are there in one half? _____

$$\frac{1}{2} = \frac{2}{4} = \frac{4}{8} = \frac{8}{16}$$

6. add $\frac{1}{4} + \frac{1}{4}$

Shade in your answer.



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Math Operations with Fractions

Add the following fractions. Be sure to reduce your answer to the lowest terms.

1. $\frac{1}{2} + \frac{1}{2}$

2. $\frac{2}{3} + \frac{1}{3}$

3. $\frac{1}{5} + \frac{1}{5}$

4. $\frac{1}{9} + \frac{4}{9}$

5. $\frac{1}{8} + \frac{3}{8}$

6. $1\frac{1}{7} + 2\frac{1}{7}$

7. $3\frac{1}{4} + 1\frac{1}{4}$

8. $4\frac{1}{11} + 1\frac{2}{11}$

9. $9\frac{6}{15} + 2\frac{3}{15}$

10. $3\frac{1}{4} + 1\frac{1}{4}$

11. $3\frac{3}{8} + 2\frac{1}{8}$

12. $6\frac{1}{14} + 2\frac{1}{14}$

13. $12\frac{7}{8} + 11\frac{5}{8}$

14. $4\frac{4}{5} + 2\frac{3}{5}$

15. $3\frac{1}{8} + 6\frac{7}{8}$

16. $9\frac{1}{8} + 6\frac{7}{8} + 2\frac{5}{8}$

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Common Denominator Work Sheet

Write a common denominator for the following fractions:

1. $\frac{1}{2}$ $\frac{1}{4}$ _____

2. $\frac{1}{3}$ $\frac{1}{9}$ _____

3. $\frac{1}{4}$ $\frac{1}{6}$ _____

4. $\frac{1}{9}$ $\frac{1}{6}$ _____

5. $\frac{1}{5}$ $\frac{1}{10}$ _____

6. $\frac{1}{3}$ $\frac{1}{4}$ $\frac{1}{6}$ _____

7. $\frac{1}{5}$ $\frac{1}{10}$ $\frac{1}{20}$ _____

8. $\frac{1}{7}$ $\frac{1}{9}$ $\frac{1}{3}$ _____

9. $\frac{1}{9}$ $\frac{1}{3}$ $\frac{1}{6}$ _____

10. $\frac{1}{12}$ $\frac{1}{5}$ $\frac{1}{3}$ _____

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Mixed Fraction Work Sheet

Add the following mixed fractions. Reduce your answer to the lowest possible terms.

1. $6\frac{1}{2} + 2\frac{1}{3}$ = _____

2. $2\frac{1}{4} + 1\frac{1}{8}$ = _____

3. $7\frac{1}{4} + 3\frac{1}{6}$ = _____

4. $9\frac{1}{5} + 1\frac{1}{10}$ = _____

5. $7\frac{1}{8} + 1\frac{1}{6}$ = _____

6. $8\frac{1}{4} + 1\frac{1}{2}$ = _____

7. $12\frac{1}{2} + 8\frac{1}{6}$ = _____

8. $14\frac{3}{7} + 12\frac{1}{3}$ = _____

9. $14\frac{9}{10} + 11\frac{4}{5}$ = _____

10. $17\frac{1}{8} + 12\frac{1}{3}$ = _____

11. $19\frac{3}{5} + 12\frac{7}{8}$ = _____

12. $23\frac{9}{10} + 10\frac{4}{6}$ = _____

13. $15\frac{4}{5} + 10\frac{11}{15}$ = _____

14. $35\frac{1}{7} + 12\frac{1}{9}$ = _____

15. $1\frac{1}{2} + 2\frac{1}{6} + 1\frac{1}{3}$ = _____

16. $11\frac{2}{7} + 8\frac{1}{3} + 4\frac{1}{6}$ = _____

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Subtract these fractions. Reduce your answer to the lowest possible terms.

1. $3\frac{1}{4} - 1\frac{3}{4}$ = _____

2. $4\frac{1}{6} - 1\frac{5}{6}$ = _____

3. $2\frac{1}{9} - 1\frac{5}{9}$ = _____

4. $6\frac{1}{7} - 4\frac{3}{7}$ = _____

5. $12\frac{1}{9} - 6\frac{4}{9}$ = _____

6. $13\frac{1}{14} - 12\frac{5}{14}$ = _____

7. $12\frac{1}{25} - 11\frac{7}{25}$ = _____

8. $14\frac{1}{7} - 10\frac{2}{7}$ = _____

9. $7\frac{9}{16} - 2\frac{1}{3}$ = _____

10. $15 - 1\frac{1}{4}$ = _____

11. $36 - 5\frac{1}{9}$ = _____

12. $7\frac{1}{16} - 2\frac{5}{64}$ = _____

13. $12\frac{1}{4} - 6$ = _____

14. $7 - 2\frac{1}{4}$ = _____

15. $7\frac{1}{4} - 5\frac{3}{8}$ = _____

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Subtract these fractions. Reduce your answer to the lowest possible terms.

1. $3\frac{2}{5} - 1\frac{1}{5}$ = _____

2. $4\frac{1}{2} - 1\frac{1}{6}$ = _____

3. $9\frac{7}{8} - 2\frac{7}{8}$ = _____

4. $12\frac{5}{6} - 8\frac{1}{6}$ = _____

5. $9\frac{4}{5} - 2\frac{1}{10}$ = _____

6. $11\frac{3}{4} - 3\frac{1}{6}$ = _____

7. $4\frac{7}{8} - 1\frac{1}{3}$ = _____

8. $12\frac{8}{15} - 1\frac{1}{3}$ = _____

9. $7\frac{2}{3} - 1\frac{5}{6}$ = _____

10. $12\frac{3}{5} - 1\frac{7}{10}$ = _____

11. $178\frac{4}{5} - 51\frac{1}{3}$ = _____

12. $52\frac{3}{8} - 16\frac{23}{32}$ = _____

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PRACTICE PAGE: Multiply these fractions. Reduce your answer to the lowest possible terms.

1. $\frac{1}{2} \times \frac{1}{2} =$

2. $\frac{1}{4} \times \frac{1}{4} =$

3. $\frac{4}{5} \times \frac{1}{6} =$

4. $\frac{1}{5} \times \frac{2}{5} =$

5. $\frac{4}{5} \times \frac{7}{10} =$

6. $\frac{3}{8} \times \frac{2}{5} =$

7. $\frac{4}{5} \times \frac{6}{10} =$

8. $\frac{8}{14} \times \frac{6}{12} =$

9. $\frac{3}{12} \times \frac{5}{20} =$

10. $\frac{4}{15} \times \frac{6}{10} =$

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Math operations with Fractions. Multiply the following fractions. Reduce your answer to the lowest common denominator.

1. $1\frac{1}{2} \times 1\frac{1}{2} =$

2. $1\frac{5}{7} \times 2\frac{1}{24} =$

3. $2\frac{1}{7} \times 2\frac{4}{5} =$

4. $5\frac{1}{3} \times 2\frac{1}{4} =$

5. $1\frac{7}{9} \times 4\frac{1}{2} =$

6. $4\frac{2}{5} \times 2\frac{8}{11} =$

7. $1\frac{7}{10} \times 1\frac{11}{14} =$

8. $2\frac{2}{9} \times 5\frac{2}{5} =$

9. $2\frac{1}{5} \times 1\frac{13}{22} =$

10. $1\frac{3}{16} \times 1\frac{13}{19} =$

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Practice Page: Divide the following fractions. Reduce your answer to the lowest possible terms.

1. $\frac{1}{2}$ -:- $\frac{1}{2}$ =

2. $\frac{1}{3}$ -:- $\frac{1}{3}$ =

3. $\frac{3}{4}$ -:- $\frac{2}{3}$ =

4. $\frac{3}{8}$ -:- $\frac{1}{2}$ =

5. $\frac{7}{8}$ -:- $\frac{3}{5}$ =

6. $\frac{7}{12}$ -:- $\frac{1}{3}$ =

7. $\frac{3}{4}$ -:- $\frac{4}{7}$ =

8. $\frac{5}{12}$ -:- $\frac{5}{6}$ =

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WORK RELATED Problems with Mixed Fractions

1. Fred works as a truck driver. His the miles on his route is added each day. Last Friday he drove $10\frac{1}{2}$ miles for his first stop, $14\ \frac{6}{10}$ miles for the second stop, and $1\frac{3}{10}$ of a mile for the third stop. How many miles did he drive all together?

A. $25\frac{1}{2}$

B. $26\frac{7}{10}$

C. $26\frac{2}{5}$

D. $26\frac{1}{2}$

2. The following Friday Fred drove the same amount of miles (see problem 2) but he took the truck to the garage at the end of the day. The garage was 6 1/5 miles from his last stop on that day. How far did he have to drive?

A. $31\frac{2}{5}$

B. $33\ \frac{4}{5}$

C. $32\frac{3}{5}$

D. $32\frac{1}{5}$

3. The company needed new security fencing around the plant. The land around the factory measured $3\ \frac{7}{10}$ miles on each of its four sides. How many miles of security fencing is needed to replace the old fencing?

A. $14\ \frac{1}{5}$ miles of fencing

B. $13\frac{8}{10}$ miles of fencing

C. $12\frac{3}{10}$ miles of fencing

D. $14\frac{8}{10}$ miles of fencing

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4. The value of stock went from $19\frac{3}{8}$ to $21\frac{1}{4}$ between June 1 and June 30. How many points in value did the stock change during the month of June?

A. $\frac{7}{8}$

B. $1\frac{1}{4}$

C. $1\frac{3}{8}$

D. $1\frac{7}{8}$

5. The company storeroom needed to be painted. Tim mixed 5/6 of a pint of thinner in each gallon of paint he used. How many pints of thinner did Tim use to complete the job that requires 24 gallons of paint?

A. 18 pints
B. 20 pints
C. $18\frac{5}{6}$ pints
D. 22 pints

6. The bulldozer-driver clocks the distance traveled each day. He works 8 hours and drives $31\frac{7}{10}$ miles each day. How many miles does he drive each 5 day week?

A. 158 miles
B. $160\frac{7}{10}$ miles
C. 159 miles
D. 125 5/7 miles
E. None of these

Answers: 1. c $26\frac{2}{5}$ 2. c. $32\frac{3}{5}$ 3. a $14\frac{1}{5}$ miles of fencing 4. d $1\frac{7}{8}$ 5. b 20 pints 6. 125 5/7

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Changing Fractions to Decimals

Write each fraction as a decimal. Divide the bottom number into the top number.

1. $\frac{1}{10}$ = _____

2. $\frac{1}{100}$ = _____

3. $\frac{1}{1000}$ = _____

4. $\frac{1}{10,000}$ = _____

5. $\frac{1}{100,000}$ = _____

Write each decimal as a fraction.

6. .7 _____

7. .07 _____

8. .007 _____

9. .0007 _____

10. .00007 _____

11. .000007 _____

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Write each fraction as a decimal.

1. $\frac{5}{10}$

2. $\frac{23}{100} =$ _____

3. $\frac{8}{10} =$ _____

4. $\frac{7}{10{,}000} =$ _____

5. $\frac{475}{10{,}000} =$ _____

6. $\frac{32}{100} =$ _____

7. $\frac{6750}{10{,}000} =$ _____

8. $\frac{3}{10{,}000} =$ _____

9. $\frac{4}{1000} =$ _____

10. $\frac{6}{10{,}000} =$ _____

11. $\frac{95}{1000} =$ _____

12. $\frac{787}{10{,}000} =$ _____

13. $\frac{65}{100{,}000} =$ _____

14. $\frac{2}{100{,}000} =$ _____

15. $\frac{701}{10{,}000} =$ _____

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Changing Fractions to Decimals and to Percents.

1.	$\frac{1}{2}$ =	.50	50%
2.	$\frac{1}{4}$ =	_____	_____
3.	$\frac{1}{5}$ =	_____	_____
4.	$\frac{1}{8}$ =	_____	_____
5.	$\frac{2}{5}$ =	_____	_____
6.	$\frac{5}{8}$ =	_____	_____
7.	$\frac{9}{10}$ =	_____	_____
8.	$\frac{7}{12}$ =	_____	_____
9.	$\frac{7}{8}$ =	_____	_____

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10. $\frac{1}{3}$ = _____ _____

11. $\frac{2}{3}$ = _____ _____

12. $\frac{1}{6}$ = _____ _____

13. $\frac{4}{5}$ = _____ _____

14. $\frac{3}{16}$ = _____ _____

15. $\frac{9}{20}$ = _____ _____

16. $\frac{4}{25}$ = _____ _____

17. $\frac{7}{25}$ = _____ _____

18. $\frac{17}{20}$ = _____ _____

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Changing Decimals to Fractions and Percents

Change to a **fraction in lowest terms** and a **percent.**

1.	.40	$\frac{40}{100} = \frac{4}{10} = \frac{2}{5}$	40%
2.	.60		
3.	.5		
4.	.65		
5.	.065		
6.	.8		
7.	.28		
8.	.12		
9.	.012		
10.	.783		

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Math: Finding % of a whole

I. Understanding /Outcome: Finding % of a whole number

Materials: Newspaper ads for discounts, menus, calculator, paper and pencil. Supplementary materials:

III. Demonstration	
Activate prior knowledge. Introduce concept of percentage of a whole.	Suggested activities. 1. Have you ever gone to a store close-out sale where the first week, everything is 10% off, the second week--20% off, the third week 30% off, the 4th week 50% off, and the last week 75% off? When it says 10% off, what does that mean? (% off regular price) Where else have you see % or need to understand % of a whole? (Figuring a tip)

IV. Exercise/Engagement:	
Practice finding percentage of a whole using newspaper ads or figuring tips from meals based on a menu. Reinforce with supplementary materials if needed. Discuss problems using suggestions from learners' strategies.	1. If a sale starts 30% off items, how do you determine what the cost will be? 2. Discuss in pairs, how to change percentages to decimals and then multiply. Continue with examples.

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V. Workplace Application: Finding percentages is a necessary skill used in some work place calculations and also used when figuring out pay deductions and waste tracking.

VI. Evaluation/Comments:

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Find the percentage of a whole number.

1. 5% of 100 = _____

2. 10% of 80 = _____

3. 16% of 80 = _____

4. 35% of 95 = _____

5. 30% of 600 = _____

6. 75% of 400 = _____

7. 60% of 36 = _____

8. 28% of 56 = _____

9. 19% of 400 = _____

10. $66\frac{2}{3}$% of 300 = _____

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Word List for *Numbers at Work*

abbreviation: a short way of writing something. The abbreviation for Gross Vehicle Weight Rating is GVWR.

average - the average of a set of numbers is found by adding a set numbers together and dividing by the amount of numbers that make up the sum.
Ex. 12 + 14 + 15 + 19 = 60 60 -:- 4 = 15

bar graph -- a graph that uses bars (stripes or bands) to picture the relationships among numbers. Bar graphs show data based on a vertical axis and a horizontal axis in the form of bars. They are very good for comparing information.
basic operations

basic math signs and operations -

- \+ addition or positive number
- \- subtraction or negative number
- x multiplication or unknown number
- / division
- -:- division
- > greater than
- < less than

canceling- a shortcut when multiplying fractions. It means dividing a top and a bottom number by a figure that goes evenly into both before actually multiplying. It is not necessary to cancel to get the right answer, but it makes multiplying easier.

chart -- a graphic representation of data that lists exact numbers in columns and rows
common denominator

column -- a group of numbers or words that are listed vertically, (up and down) in a table or chart

compare -- to look at two or more numbers and see their similarities and differences; also to decide which is larger or smaller.

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convert -- to change one thing to another. Sometimes it's necessary to convert meters to yards.

decimal

decimal point - a dot written in a series of numbers that has the places of whole numbers to the left of it and decimal places to the right of it.

denominator - the bottom number of a fraction, it wills how many parts are in the whole

digit

dimensions -- the length, width, and/or depth of an object. The dimensions of the sheet of steel were: length, 10 feet; width, 5 feet

equal - being the same or identical to in value

fraction -- a part of a whole, a number less than one but greater than zero Ex. $\frac{1}{4}$

graphs - a picture or map of numbers, tools for displaying data. There are many different kinds of graphs including bar graphs, line graphs, and pie charts or circle graphs.

higher terms - to change a fraction to larger numbers so you can continue with adding, subtracting, multiplying and dividing. $\frac{1}{5}$ can be raised to $\frac{2}{10}$ or $\frac{20}{100}$

improper fraction - the top number is *equal to or larger than* the bottom number.

intersect -- to meet and cross at a point, in a chart or table

invert - means to turn a fraction upside down. $\frac{7}{10}$ can be inverted to $\frac{10}{7}$

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lowest terms - to change a fraction to the lowest numbers possible. $\frac{2}{8}$ can be reduced to the lowest terms of $\frac{1}{4}$.

math operations - are addition, subtraction, multiplication, and division

mean - the average of a set of numbers, calculated by adding a set numbers together and dividing by the number of sets in the sum. Ex. 12 + 14 + 15 + 19 = 60
60 -:-4 = 15

metric system -- a system of measurement based on tens, used by most people outside the Untied States. Unites such as centimeters, millimeters, grams, and kilograms are used in the metric system

minus sign (-) - The sign for subtraction or a negative number

mixed numbers - a whole number written next to a proper fraction, $3\frac{1}{3}$. To perform math operations to some mixed numbers, they must be changed to improper fractions.

$3\frac{1}{3}$ is changed to $\frac{10}{3}$.

multiplication sign (x) - the sign for multiplication.

negative number - a number less than zero

numerator - the upper number of a fractions, it tells how many parts you have

proper fraction the top number is less than the bottom number -- $\frac{1}{3}$

plus sign (+) - the sign for addition or a positive number

positive number - a number greater than zero

quotient - the answer to a division problem

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reduce (a fraction) - means writing it with smaller numbers.
$\frac{25}{100}$ can be reduced to $\frac{1}{4}$

relationship -- a connection between people or things. Graphs and charts show the relationships of numbers

rounding off - to write numbers to the nearest place value given, eliminating the smaller place values that are not needed.

table -- a graphic representation of data that lists exact numbers in columns and rows

technology -- Machines and ways of doing things that improve the speed and/or quality of work. The use of computers in manufacturing is an example of modern technology.

U. S. customary units -- the way people in the United States usually measure, using units such as inches, feet, miles, ounces, and pounds. In many industries, U. S. customary units are being replaced by the metric system.

whole numbers - the numbers most commonly used in counting (0, 1, 2, 3, 4, . . .)

width -- the distance from one side to another of something. In rectangles, the shorter dimension. The length of the rectangle was 50 centimeters, the width was 20 centimeters

x - the sign for multiplication. Can also stand for an unknown number.

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Numbers at Work Preview

Name: _____ *Date:* _____
Code Number: _____ _____ *Course Number:* _____

1.
43
43
52
+ 39

2.
8 hr. 42 min.
9 hr. 14 min.
10 hr. 21 min.
11 hr. 5 min.
+ 9 hr. 32 min.

3.
65,758 lb.
+ 26,946 lb.

4.
42 hr. 13 min.
- 6 hr. 49 min.

5.
$807.
- 216.

6.
89.82
X 5

7. 720 -:- 36 =

8. 697.45 -:- 37 =

9. 4.8 hr. = 4 hours and _____ minutes

10. Round 618.737 to the nearest hundredth. _____

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11. .614 + 3 + 2.8 + 743.1 =

12. 37.6 - 21.792 =

	Load A	Load B	Load C	Clock Hours	Down Time	Production Hours
Monday	2	1	1	8.00	1.20	6.80
Tuesday	3	2	1	8.00	.51	7.49
Wednesday	2	2	1	8.00	1.07	6.93
Thursday	3	2	1	8.00	.20	7.80
Friday	3	1	2	8.00	.47	7.53
Saturday						
Total						

13. What is the total number of clock hours? _____

14. What is the total number of production hours? _____

15. What is the total amount of down time? _____

16. Give the total amount of down time from question 15 in hours and minutes. _____

17. What is the difference between total of clock hours and total production hours? _____

18. If a driver's weekly pay is $497.20 and s/he worked 40 production hours, what is the hourly rate? _____

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Numbers at Work Review

Name: _____ ***Date:*** _____
Code Number: _____ ***Course Number:*** _____

1.
$$\begin{array}{r} 43 \\ 43 \\ 52 \\ +\ 39 \\ \hline \end{array}$$

2.
$$\begin{array}{rr} 8 \text{ hr.} & 42 \text{ min.} \\ 9 \text{ hr.} & 14 \text{ min.} \\ 10 \text{ hr.} & 21 \text{ min.} \\ 11 \text{ hr.} & 5 \text{ min.} \\ +\ 9 \text{ hr.} & 32 \text{ min.} \\ \hline \end{array}$$

3.
$$\begin{array}{r} 65{,}758 \text{ lb.} \\ +\ 26{,}946 \text{ lb.} \\ \hline \end{array}$$

4.
$$\begin{array}{rr} 42 \text{ hr.} & 13 \text{ min.} \\ -\ 6 \text{ hr.} & 49 \text{ min.} \\ \hline \end{array}$$

5.
$$\begin{array}{r} \$807. \\ -\ 216. \\ \hline \end{array}$$

6.
$$\begin{array}{r} 89.82 \\ \times \quad 5 \\ \hline \end{array}$$

7. 720 -:- 36 =

8. 697.45 -:- 37 =

9. 4.8 hr. = 4 hours and _____ minutes

10. Round 618.737 to the nearest hundredth. _____

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11. .614 + 3 + 2.8 + 743.1 =

12. 37.6 - 21.792 =

	Load A	Load B	Load C	Clock Hours	Down Time	Production Hours
Monday	2	1	1	8.00	1.20	6.80
Tuesday	3	2	1	8.00	.51	7.49
Wednesday	2	2	1	8.00	1.07	6.93
Thursday	3	2	1	8.00	.20	7.80
Friday	3	1	2	8.00	.47	7.53
Saturday						
Total						

13. What is the total number of clock hours? _____

14. What is the total number of production hours? _____

15. What is the total amount of down time? _____

16. Give the total amount of down time from question 15 in hours and minutes. _____

17. What is the difference between total of clock hours and total production hours? _____

18. If a driver's weekly pay is $497.20 and s/he worked 40 production hours, what is the hourly rate? _____

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Scoring Guide for Numbers at Work Preview and Review

1. 43
   43
   52
   + 39
   177

2. 8 hr. 42 min.
   9 hr. 14 min.
   10 hr. 21 min.
   11 hr. 5 min.
   + 9 hr. 32 min.
   48 hr. 54. min.

3. 65,758 lb.
   + 26,946 lb.
   92,704 lb.

4. 42 hr. 13 min.
   - 6 hr. 49 min.
   31 hr. 24 min.

5. $807.
   - 216.
   $591.

6. 89.82
   X 5
   449.10

7. 720 -:- 36 = **20**

8. 697.45 -:- 37 = **18.85**

9. 4.8 hr. = 4 hours and **48** minutes

10. Round 618.737 to the nearest hundredth. **618.74**

11. .614 + 3 + 2.8 + 743.1 = **749.514**

12. 37.6 - 21.792 = **15.808**

13. What is the total number of clock hours? **40 hours**

14. What is the total number of production hours? **36.55 hours**

15. What is the total amount of down time? **3.45 hours**

16. Give the total amount of down time from question 15 in hours and minutes. **3 hours 27 minutes**

17. What is the difference between total of clock hours and total production hours? **3 hours 27 minutes or 3.45 hours**

18. If a driver's weekly pay is $497.20 and s/he worked 40 production hours, what is the hourly rate? **$12.43 per hour**

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